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AN ANNOTATED BIBLIOGRAPHY OF PATENTS RELATED TO COASTAL ENGINE--ETC(U)

NOV 79 R E RAY, M D DICKEY, A M LYLES

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MR 79-6

An Annotated Bibliography of Patents  
Related to Coastal Engineering

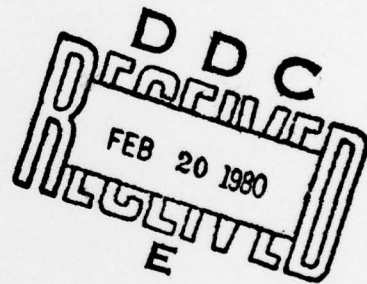
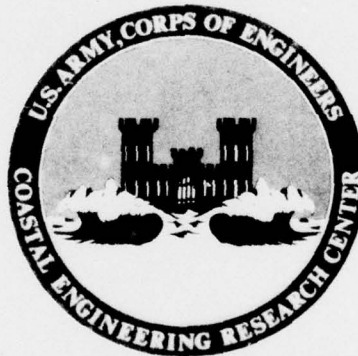
**LEVEL**

by

Robert E. Ray, Michael D. Dickey, and Annie M. Lyles

MISCELLANEOUS REPORT NO. 79-6

NOVEMBER 1979



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| 4. TITLE (and Subtitle)<br>AN ANNOTATED BIBLIOGRAPHY OF PATENTS<br>RELATED TO COASTAL ENGINEERING.<br>A080195 - A080797  | 5. TYPE OF REPORT & PERIOD COVERED<br>Miscellaneous Report   | 6. PERFORMING ORG. REPORT NUMBER  |
| 7. AUTHOR(s)<br>Robert E. Ray Michael D. Dickey<br>Annie M. Lyles  | 8. CONTRACT OR GRANT NUMBER(s)   | 9. PROGRAM ELEMENT, PROJECT, TASK<br>AREA & WORK UNIT NUMBERS<br>F31234 |
| 10. PERFORMING ORGANIZATION NAME AND ADDRESS<br>Department of the Army<br>Coastal Engineering Research Center (CEREN-CD)<br>Kingman Building, Fort Belvoir, Virginia 22060   | 11. CONTROLLING OFFICE NAME AND ADDRESS<br>Department of the Army<br>Coastal Engineering Research Center<br>Kingman Building, Fort Belvoir, Virginia 22060 | 12. REPORT DATE<br>November 1979  |
| 13. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)  | 14. SECURITY CLASS. (of this report)<br>UNCLASSIFIED   | 15. DECLASSIFICATION/DOWNGRADING<br>SCHEDULE                            |
| 16. DISTRIBUTION STATEMENT (of this Report)<br><br>Approved for public release, distribution unlimited.  |  |   |
| 17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)<br><br>14 CERC-MR-79-6  |  |   |
| 18. SUPPLEMENTARY NOTES  |  |   |
| 19. KEY WORDS (Continue on reverse side if necessary and identify by block number)<br><br>Bibliography                      Coastal engineering                      Patents   |  |   |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br><br>This report describes a collection of 2,468 coastal engineering patents issued by the U.S. Patent Office from 1967 to 1976, a bibliographical guide to the collection, and the use of the patents and search aids. Patent topics include: coastal structures and structural components, structure protection and maintenance, construction methods and equipment, field research and survey instruments, hydraulic laboratory modeling equipment, marine pollution<br>(continued) |  |   |

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control apparatus, and ocean energy extraction devices. The bibliography is a separate ~~limited-edition~~ three-volume appendix to this report dividing the 10-year period into three parts. Each volume includes a list of patent titles and numbers and an index by keywords as well as the patent annotations.

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## PREFACE


This report describes the preparation and use of a collection of patents on coastal engineering issued by the U.S. Patent Office from 1967 to 1976 and of an annotated bibliography of the collection. Preparation of the collection and bibliography was carried out under the coastal engineering research program of the U.S. Army Coastal Engineering Research Center (CERC). The bibliography, contained in three volumes, has been published as a limited-edition appendix to this report due to its large size.

The report and its appendix were prepared by Robert E. Ray, Hydraulic Engineer, with the assistance of Michael D. Dickey and Annie M. Lyles, Civil Engineering Technicians, under the general supervision of R.A. Jachowski, Chief, Coastal Design Criteria Branch, Engineering Development Division. A. Szuwalski and T.J. Lawler prepared the computer programs that generated the keyword index to the bibliography, and W.T. Whitt assisted in preparing the annotations.

The authors gratefully acknowledge the efforts of T.O. Maser, C.L. Pistorino, and other personnel of the Office of the Chief Counsel, Office of the Chief of Engineers, for their guidance in choosing a method of searching for patents, their provision of publications used in the search, including arranging loans from other service libraries, and their help in obtaining high-quality copies of patents from the U.S. Patent Office.

The collection may be extended to earlier and more recent patent if use of the collection by coastal engineers in the Corps justifies the effort. The topics of an expanded collection may cover a broad range, as in the present collection, or may be more limited, depending on the needs of the Corps. Inquiries and comments about this publication and the collection are invited.

Approved for publication in accordance with Public Law 166, 79th Congress, approved 31 July 1945, as supplemented by Public Law 172, 88th Congress, approved 7 November 1963.

  
TED E. BISHOP  
Colonel, Corps of Engineers  
Commander and Director

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| NTIS          | GR&I                 |
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| Dist.         | Availability Codes   |
| A             | Avail and/or special |



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AN ANNOTATED BIBLIOGRAPHY  
OF  
PATENTS RELATED TO COASTAL ENGINEERING

by  
Robert E. Ray, Michael D. Dickey, and Annie M. Lyles

I. INTRODUCTION

A *patent* is a legal document defining an invention and granting the inventor control of the manufacture, use, and sales of the invention in the United States for 17 years. It is valuable both as a grant of rights to the inventor and as a source of new ideas and, in cases where laboratory or field testing was conducted before application for a patent, of information on the performance of an invention. By the end of 1976, the United States had issued over 4 million patents. Searching such a massive collection for patents in particular categories is difficult, and scientists and engineers have found that problems with the classification system make use of the collection prohibitively time consuming.

The Coastal Engineering Research Center (CERC) has collected patents issued between 1967 and 1976 that are related to the Center's fields of interest and the Corps of Engineers' responsibilities. The collection is located in the Center's library. A three-volume bibliographical guide to that collection has been prepared to simplify the searcher's task of finding needed patents. Each volume contains a list of the numbers and titles of the patents described in the volume, annotations giving information on each patent, and a subject index based on assigned keywords. The bibliography has been published as a separate appendix to this report and has been distributed only to the libraries listed in Table 1, but it may be ordered from the National Technical Information Service (NTIS). This report discusses the information in patents and the methods of searching a general collection of patents for information on a particular type of invention. It describes the search methods used to find patents for the CERC collection, the format of the CERC bibliography, and the methods of using the bibliography to find patents related to coastal engineering.

The Shore Protection Manual (SPM) (U.S. Army, Corps of Engineers, Coastal Engineering Research Center, 1977)<sup>1</sup> defines coastal engineering as "the application of the physical and engineering sciences to the planning, design and construction of works to modify or control the interaction of the air, sea, and land in the coastal zone for the benefit of man and for the enhancement of natural shoreline resources." The Corps' involvement in coastal engineering includes shore and beach restoration and protection, hurricane flood protection, construction and operation

<sup>1</sup>U.S. ARMY, CORPS OF ENGINEERS, COASTAL ENGINEERING RESEARCH CENTER, *Shore Protection Manual*, 3d ed., Vols. I, II, and III, Stock No. 008-022-00113-1, U.S. Government Printing Office, Washington, D.C., 1977, 1,262 pp.



Table 1. Libraries having copies of the CERC patent bibliography.

Corps of Engineers Libraries

|                        |                                     |
|------------------------|-------------------------------------|
| Atlanta, Ga.           | South Atlantic Division             |
| Chicago, Ill.          | North Central Division              |
| Dallas, Tex.           | Southwestern Division               |
| Fort Belvoir, Va.      | Coastal Engineering Research Center |
| Fort Shafter, Honolulu | Pacific Ocean Division              |
| New York, N.Y.         | North Atlantic Division             |
| Portland, Oreg.        | North Pacific Division              |
| San Francisco, Calif.  | South Pacific Division              |
| Vicksburg, Miss.       | Lower Mississippi Valley Division   |
| Vicksburg, Miss.       | Waterways Experiment Station        |
| Waltham, Mass.         | New England Division                |
| Washington, D.C.       | Office of the Chief of Engineers    |

Other Federal Libraries

|                      |   |
|----------------------|---|
| Alexandria, Va.      | U.S. Naval Facilities Engineering Command |
| Arlington, Va.       | Patent Office Scientific Library          |
| Port Hueneme, Calif. | U.S. Navy, Civil Engineering Lab          |
| Washington, D.C.     | Library of Congress                       |

Public and University Libraries

|                     |  |
|---------------------|--|
| Berkeley, Calif.    | University of California Library               |
| Boston, Mass.       | Public Library                                 |
| Chicago, Ill.       | Public Library                                 |
| Denver, Colo.       | Public Library                                 |
| Houston, Tex.       | Fondren Library - Rice University              |
| Los Angeles, Calif. | Public Library                                 |
| New York, N.Y.      | Public Library                                 |
| Philadelphia, Pa.   | Franklin Institute Library                     |
| Seattle, Wash.      | Engineering Library - University of Washington |
| Stillwater, Okla.   | Oklahoma State University Library              |

of navigation and recreation projects, the related control of water quality, conservation and enhancement of fish and wildlife in the coastal zone, and an interest in development of coastal electric power.

In general, the collection contains any water or earth control structure, and any large structures supported by piles, jackets, or the sea bottom, useful in the geographic area from tidal marshland and estuary to the Inner Continental Shelf. Related patents for seabed foundations and structural anchors, small-craft harbor structures, and fouling or corrosion prevention systems are presented. Also included are construction methods and equipment, emphasizing dredges and piledrivers. Inventions useful in coastal research, such as bathymetric and seismic survey systems, water and seabed soil samplers, instruments for measuring water and bottom properties, and laboratory flumes and wave generators, comprise part of the patent collection. Also presented are pollutant detection, control, and removal equipment for use in open water, and ocean energy extraction devices.

Although mining, transporting, and prospecting for offshore minerals are not subjects of direct interest to the Corps, many devices used in

those fields, from offshore mining equipment and pipeline trenchers to seabed storage tanks and jack-up drilling platforms, are included in the patent collection because of their relation to dredging, excavating, offshore harbors, and seabed foundations. Shipbuilding and loading structures, which fall into the fields of harbor and marine engineering, are not of specific interest to the Corps, but patents on small-craft harbor structures and methods for maintaining harbor navigation are also in the collection. The collection contains piles and pile-driving equipment of all types usable for work in the coastal region, not just those specifically used for offshore and harbor structures.

The collection is already in use at CERC, where researchers have, for example, used the bibliography to locate patents describing the operating principles of specific types of electronic wave gages, information not found in electronics texts or in manufacturers' literature. Requests from inventors and Corps offices for predictions of the behavior of newly patented, but untested, low-cost shore protection methods have been answered by searching the collection for patents on similar designs which had been used in the field. Patent attorneys within the Corps are using the subject index as an aid in searching the Patent Office's collection to determine the possibility of patenting devices developed by the Corps. Planners and designers in the Corps should find the CERC collection of patents useful as a source of data on new options in solving coastal engineering problems.

## II. INFORMATION IN PATENTS

Patents are issued each Wednesday, and all patents for the week bear the same date of issue. Since 1836, patents have been assigned reference numbers in a common sequence; thus, the four-millionth patent issued received the number 4,000,000. As illustrated in Figure 1, in addition to the patent number, title, date of issue, application number, and date of application, each patent document contains the name and address of the inventor and, if the inventor has granted patent rights to a company or another individual, of the assignee. The bulk of the patent consists of the figures and the text, comprising a broad description of the figures and the inventor's ideas, a numbered list of claims which delineate the specific ideas that the patent controls, and, if the patent's application was submitted after 1 January 1967, an abstract briefly summarizing the rest of the text. Corrections of typographical and other minor errors in a patent are noted on a "Certificate of Correction" included in document.

Each patent is assigned a set of U.S. and international classification codes used for filing the patent according to precisely defined topics. The U.S. classification system is revised periodically so the classification codes listed in the patent at the time of issue may not be the codes currently assigned to it. The patent codes represent an "original classification" best characterizing the patent, and "cross-reference classifications" which further describe aspects of the patent. The U.S. original classification code is printed on every patent. Patent documents have contained both U.S. cross-reference classification and international codes since December 1968. The *Manual of Classification of Patents* (Department of Commerce, Patent and Trademark Office,

**United States Patent** [19]  
**Tazaki et al.**

[11] **3,991,576**  
 [45] **Nov. 16, 1976**

[54] **FLOATING BREAKWATER** 1,933,597 11/1933 McVitty..... 61/5 X  
 [75] **Inventors: Sandanori Tazaki, Kodairo; Yozo** 2,658,350 11/1953 Magill..... 61/5  
**Ishida, Kunitachi, both of Japan** 3,503,214 3/1970 Desty et al. .... 61/1 F  
 3,791,150 2/1974 Tachii..... 61/5

[73] **Assignee: Bridgestone Tire Company Limited,**  
**Tokyo, Japan**

[22] **Filed: Dec. 27, 1974**

[21] **Appl. No.: 536,783**

**Related U.S. Application Data**

[62] **Division of Ser. No. 398,368, Sept. 18, 1973.**

**[30] Foreign Application Priority Data**

Sept. 19, 1972 Japan..... 47-107980  
 Sept. 30, 1972 Japan..... 47-113640  
 May 9, 1973 Japan..... 48-54312

[52] **U.S. Cl.**..... 61/5

[51] **Int. Cl.<sup>2</sup>**..... E02B 3/06

[58] **Field of Search**..... 9/8 R; 61/1 F, 3, 4,  
 61/5; 114/5 F

**[56] References Cited**

**UNITED STATES PATENTS**

436,644 9/1890 White..... 61/5

*Primary Examiner*—Paul R. Gilliam  
*Assistant Examiner*—David H. Corbon  
*Attorney, Agent, or Firm*—Sughrue, Rothwell, Mion,  
 Zinn and Macpeak

**[57] ABSTRACT**

A floating breakwater in which the floating body is formed by housing a floating material as a floating source and a weighting material as a source for increasing weight in a hollow shell composed of a rigid material and provided with a projection on the upper portion. The specific gravity of the floating body is made to be 0.15 - 0.75 owing to the floating material and the weighting material.

**1 Claim, 16 Drawing Figures**

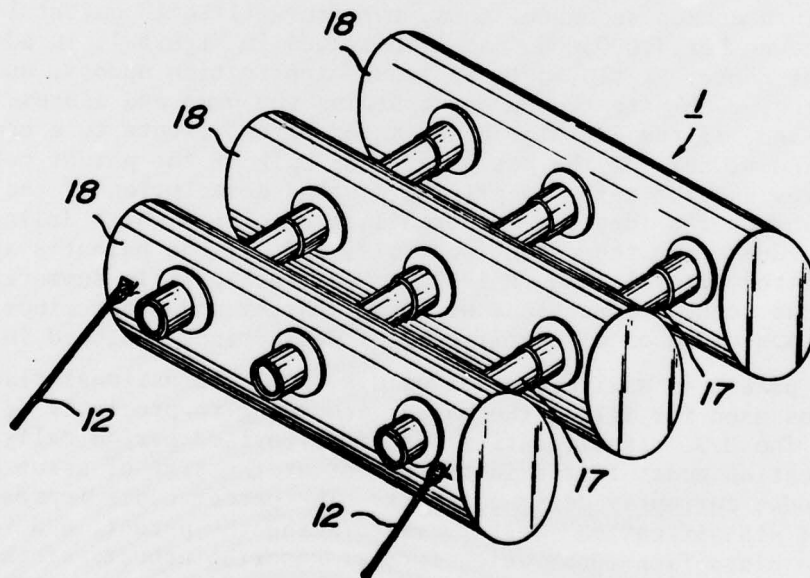


Figure 1. Typical front page of a patent document.



1975<sup>2</sup> gives explanations of the U.S. codes. Figure 2 shows a typical page from the manual. The U.S. Patent Office has available lists of all patent numbers presently referenced to each U.S. classification code by original or cross-reference classification.

The names of the inventor's attorney and the U.S. Patent Office examiner who reviewed the application are included in the patent, along with information on closely related patents discovered in their search. The number, date of issue, inventor, and original classification code of these patents are listed. Most patents issued since October 1970 also have a list of the classifications searched for the review.

Inventors make revisions to patents by having them reissued. Reissued patents are assigned reference numbers preceded by the abbreviation "Re." in a sequence separate from the original patents. The complete text of the original patent is in the reissue with deletions in brackets and additions in italics.

The format of patents was changed in 1970 to streamline the search process and prepare the documents for inclusion in a computer processable library. All of the above information, an abstract, and an exemplary figure are on the first page of the patent document as shown in Figure 1. Each data element on the page is identified with an internationally recognized numeric code for worldwide use of the information.

### III. FINDING PATENTS

Complete copies of all patents in the CERC collection are filed in numerical order in bound reference volumes in the CERC library. At the U.S. Patent Office Public Search Room, Crystal Plaza, 2221 Jefferson Davis Boulevard, Arlington, Virginia, all issued patents are filed both on microfilm in numerical order and in printed copies under their assigned classification codes (original or cross-reference). Table 2 lists the libraries in the United States that have patent collections open to the public. Copies of patents may be ordered by patent number for 50 cents apiece (1979) by writing the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Several methods of finding patents in desirable categories are available to the searcher. Patent attorneys and examiners with access to the Public Search Room commonly use guides to the patent classification system to pick the classification codes covering the types of inventions desired, then directly search the files under those codes. If the sole available collection is filed only in numerical order, the searcher obtains the Patent Office's lists of patent numbers assigned the chosen codes. Searchers who must keep a current record of patents in a particular technical field can subscribe to the *Official Gazette* (Department

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<sup>2</sup>DEPARTMENT OF COMMERCE, PATENT AND TRADEMARK OFFICE, *Manual of Classification of Patents*, U.S. Government Printing Office, Washington, D.C., 1975 (Updated to 1979).

| Original Classification 1918 |   |       |   |
|------------------------------|---|-------|---|
| 1S                           | UNDERGROUND FLUID STORAGE                                 | 94    | With anchoring of structure to marine floor               |
| 1R                           | WATER CONTROL   | 95    | By pivotal connection                                     |
| 1F                           | Control of floating matter                                | 96    | Sectional structure                                       |
| 2                            | Channels  | 97    | With auxiliary float chambers                             |
| 3                            | Forming and preserving                                    | 98    | Including floor-engaging anchoring means                  |
| 4                            | Jetties, groins and breakwaters                           | 99    | Having floor-modifying means                              |
| 5                            | Portable  | 100   | Including concrete placement                              |
| 6                            | Fluid breakwaters   | 101   | Including storage containers                              |
| 7                            | Canals  | 102   | With protecting or reinforcing structure                  |
| 8                            | Locks   | 103   | Structure in or on frozen media                           |
| 9                            | Lifting   | 104   | Including bollard means                                   |
| 10                           | Drainage  | 47    | Cribbing  |
| 11                           | Substratum  | 48    | Wharves   |
| 12                           | Irrigation  | 49    | Retaining wall type                                       |
| 13                           | Subirrigation   | 50    | Foundations   |
| 14                           | Flumes  | 51    | Underpinning  |
| 15                           | Sheet metal   | 52    | Pier  |
| 16                           | Culverts  | 53    | Piles   |
| 17                           | Intakes   | 53.5  | With installing   |
| 18                           | Spillways   | 53.52 | Casting in situ hardenable fluent material                |
| 19                           | Power   | 53.54 | With heating, cooling or explosion                        |
| 20                           | Tide and wave   | 53.56 | With subsequent moving                                    |
| 21                           | Fish ways   | 53.58 | Subsurface dispensing of material for flow toward surface |
| 22 R                         | Watergates  | 53.6  | Forming subsurface enlargement                            |
| 22 A                         | Sealing   | 53.62 | Providing embedded metallic reinforcement                 |
| 23                           | Uniform discharge   | 53.64 | Dispensing fluent material while withdrawing dispenser    |
| 24                           | Horizontally swinging                                     | 53.66 | Withdrawing form structure                                |
| 25                           | Vertically swinging                                       | 53.68 | Anchoring   |
| 26                           | Overflow  | 53.7  | Driving removable wall supporting core                    |
| 27                           | Collapsible   | 53.72 | Diametrically retractable core                            |
| 28                           | Sliding   | 53.74 | Discharging fluid lubricant or jet                        |
| 29                           | Removable   | 54    | Protected   |
| 30                           | Dams and levees   | 58    | Sheet-piling  |
| 31                           | Cores   | 59    | Concrete  |
| 32                           | Hollow  | 60    | Metallic  |
| 33                           | Tension stayed  | 61    | C and I sections  |
| 34                           | Cofferdams  | 62    | Head-and-claw interlock                                   |
| 35                           | EARTH CONTROL   | 56    | Concrete  |
| 36 R                         | Solidifying or thawing earth                              | 56.5  | Cast in situ  |
| 36 A                         | Heating or freezing                                       | 64    | DRYDOCKS  |
| 36 B                         | Chemical  | 65    | Lifting   |
| 36 C                         | Organic   | 66    | Keel and bilge blocks                                     |
| 36 D                         | Bituminous  | 67    | MARINE WAYS   |
| 37                           | Revetments  | 68    | SHIP CAISSONS   |
| 38                           | Mattresses  | 69 R  | DIVING  |
| 39                           | Retaining walls   | 69 A  | Submarine attachment                                      |
| 40                           | Shafts  | 70    | Suits   |
| 41 R                         | Shaft lining and excavation sheathing                     | 71    | Rigid elements  |
| 41 A                         | Trench shoring  | 105   | PIPE AND CABLE LAYING                                     |
| 42                           | Tunnels   | 72.2  | Casting in situ   |
| 43                           | Sectional   | 106   | With protection or indication of pipe or trench           |
| 44                           | Subways   | 107   | Submerging line of pipe or cable                          |
| 45 R                         | Tunnel lining   | 108   | Facilitated by extension from line-laying vessel          |
| 45 B                         | Roof bolts  | 109   | With causing or controlling the deformation of a line     |
| 45 C                         | Roof supports   | 110   | With assembling of line structure                         |
| 45 D                         | Mobile props  | 111   | By joining successive section of line                     |
| 45 F                         | Flexible or inflatable                                    | 112   | By control of buoyancy                                    |
| 86                           | STABLE STRUCTURES IN SHIFTING MEDIA                       | 113   | With anchoring of line                                    |
| 87                           | Structure floatable to site and supported by marine floor | 114   | With raising of line from marine floor                    |
| 88                           | Supported by submersible base                             | 72.4  | Entrenched or buried                                      |
| 89                           | And legs depending from base                              |       |   |
| 90                           | Work deck vertically adjustable relative to floor         |       |   |
| 91                           | By mechanical jack means or sectional legs                |       |   |
| 92                           | By buoyancy control                                       |       |   |
| 93                           | Deck structure horizontally movable or adjustable         |       |   |

Figure 2. Typical page from the *Manual of Classification of Patents* before 1979 revision.

Table 2. Libraries having patent collections.

|                                  |  |
|----------------------------------|--|
| Albany, N.Y.                     | State University of New York Library   |
| Atlanta, Ga. <sup>1</sup>        | Price Gilbert Library                  |
|                                  | Georgia Institute of Technology        |
| Birmingham, Ala. <sup>2</sup>    | Public Library                         |
| Boston, Mass.                    | Public Library                         |
| Buffalo, N.Y.                    | Buffalo and Erie County Public Library |
| Chicago, Ill.                    | Public Library                         |
| Cincinnati, Ohio                 | Public Library                         |
| Cleveland, Ohio                  | Public Library                         |
| Columbus, Ohio <sup>1</sup>      | Ohio State University Library          |
| Dallas, Tex. <sup>1,2</sup>      | Public Library                         |
| Denver, Colo. <sup>1,2</sup>     | Public Library                         |
| Detroit, Mich.                   | Public Library                         |
| Houston, Tex. <sup>1</sup>       | Fondren Library                        |
|                                  | Rice University                        |
| Kansas City, Mo. <sup>1</sup>    | Linda Hall Library                     |
| Lincoln, Nebr. <sup>1</sup>      | Love Memorial Library                  |
|                                  | University of Nebraska                 |
| Los Angeles, Calif. <sup>1</sup> | Public Library                         |
| Madison, Wis. <sup>1</sup>       | Wendt Engineering Library              |
|                                  | University of Wisconsin                |
| Milwaukee, Wis.                  | Public Library                         |
| Newark, N.J.                     | Public Library                         |
| New York, N.Y.                   | Public Library                         |
| Philadelphia, Pa.                | Franklin Institute Library             |
| Pittsburgh, Pa. <sup>1</sup>     | Carnegie Library                       |
| Providence, R.I.                 | Public Library                         |
| Raleigh, N.C. <sup>1</sup>       | D.H. Hill Library                      |
|                                  | North Carolina State University        |
| Seattle, Wash. <sup>1</sup>      | Engineering Library                    |
|                                  | University of Washington               |
| St. Louis, Mo. <sup>1</sup>      | Public Library                         |
| Stillwater, Okla. <sup>1</sup>   | Oklahoma State University Library      |
| Sunnyvale, Calif. <sup>3</sup>   | Sunnyvale Patent Library               |
| Toledo, Ohio                     | Public Library                         |

<sup>1</sup>Collection between 1967 and 1976 on microfilm only.

<sup>2</sup>Collections start in 1974 or 1976.

<sup>3</sup>Collection arranged by classification. All other collections are arranged numerically.



of Commerce, Patent and Trademark Office)<sup>3</sup>, a journal including summaries of each week's newly issued patents, listed by classification. They may also use the publications of organizations that search the *Official Gazette* to abstract patent information from classifications selected by the user. Computer-based record systems allowing sorting by classification codes or by keywords are available for parts of the classification system. Publications indexing patents by topics, such as the CERC Bibliography and the earlier *Oceanic Patents 1959-1968* (Sinha, 1969)<sup>4</sup>, exist for some technical fields.

#### IV. PATENT SELECTION FOR THE COLLECTION

The organization of the Patent Office's classification system did not match the categories of subjects related to coastal engineering; therefore, available aids using that system could not be used alone to find patents for the CERC collection. When writing the claims in their patents, inventors describe the function of their invention in the broadest possible terms, while being more explicit in describing the principles of operation and construction. Following this pattern, the classification system is organized in a hierarchy under functional headings. The heading might be a general "class," symbolized by the first number in a classification code, or a subordinate, more specific "subclass," represented by the second code number. Some functional headings, such as subclass 54, "Dredgers," under class 37, "Excavating," were applicable to coastal engineering and the classification code, in this case 37-54, could be used directly to find interesting patents. In other cases the heading was a class or a general subclass and each patent classified under it had to be inspected. For example, patents for methods of removing marine pollutants were interspersed among those for straining soup under class 210, "Liquid Purification or Separation." This situation required the use of a combination of search methods.

As a first step in organizing a selection process, the *Manual of Classification* was used to choose the functional classifications most closely related to the coastal engineering categories. Several *Official Gazettes* were then reviewed thoroughly and the classification codes of interesting patents noted. The result was the list of classes and corresponding code numbers given in Table 3. Due to the length and generality of the list, use of the files in the Public Search Room was impractical so the *Official Gazettes* were searched with special emphasis on the classes in the list. Figure 3 shows a typical page from an *Official Gazette*. If the information in the *Official Gazette* was insufficient to determine whether an invention was useful for coastal engineering, a copy of the patent was ordered and examined before making a final decision on its selection.

<sup>3</sup>DEPARTMENT OF COMMERCE, PATENT AND TRADEMARK OFFICE, *Official Gazette*, Washington, D.C., issued weekly.

<sup>4</sup>SINHA, E., *Oceanic Patents 1959-1968*, Ocean Engineering Information Series, Vol. 1, Ocean Engineering Information Service, La Jolla, Calif., 1969.

Table 3. Patent classes searched.

| <u>Class code</u> | <u>Class title</u>  |
|-------------------|---|
| 9                 | Boats, Buoys, and Aquatic Devices                                     |
| 14                | Bridges   |
| 35                | Education   |
| 37                | Excavating  |
| 43                | Fishing, Trapping, and Vermin Destroying                              |
| 52                | Static Structures, e.g., Buildings                                    |
| 60                | Power Plants  |
| 61                | Hydraulic and Earth Engineering                                       |
| 73                | Measuring and Testing   |
| 94                | Roads and Pavements   |
| 102               | Ammunition and Explosive Devices                                      |
| 114               | Ships   |
| 115               | Marine Propulsion   |
| 117               | Coating: Processes and Miscellaneous Products                         |
| 137               | Fluid Handling  |
| 141               | Fluent Material Handling, with Receiver or<br>Receiver Coacting Means |
| 166               | Wells   |
| 172               | Earth Working   |
| 173               | Tool Driving or Impacting   |
| 174               | Electricity, Conductors, and Insulators                               |
| 175               | Boring or Penetrating the Earth                                       |
| 181               | Acoustics   |
| 182               | Fire Escapes, Ladders, Scaffolds                                      |
| 185               | Motors, Spring, Weight, and Animal Powered                            |
| 204               | Chemistry, Electrical and Wave Energy                                 |
| 210               | Liquid Purification or Separation                                     |
| 214               | Material or Article Handling  |
| 239               | Fluid Sprinkling, Spraying, and Diffusing                             |
| 249               | Static Molds  |
| 250               | Radiant Energy  |
| 252               | Compositions  |
| 253               | Motors, Fluid   |
| 264               | Plastic and Non-Metallic Article Shaping                              |
| 290               | Prime-Mover Dynamo Plants   |
| 299               | Mining or In Situ Disintegration of Hard<br>Material                  |
| 302               | Conveyors, Fluid Current  |
| 324               | Electricity, Measuring, and Testing                                   |
| 340               | Communications, Electrical  |
| 356               | Optics, Measuring, and Testing  |
| 415               | Rotary Kinetic Fluid Motors or Pumps                                  |
| 417               | Pumps   |

3,849,988

**COMBUSTION CHAMBERS FOR INTERNAL  
COMBUSTION ENGINES EQUIPPED WITH A  
TURBO-COMPRESSOR UNIT WITH REHEATING  
UPSTREAM OF THE TURBINE**

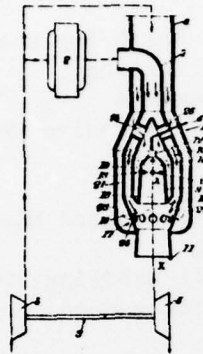
Jean Melchior, Paris, France, assignor to Etat Francais, Paris,  
France

Filed Mar. 29, 1973, Ser. No. 345,966

Claims priority, application France, Apr. 6, 1972, 72.12112  
Int. Cl. E02b 37/04

U.S. Cl. 60-606

21 Claims



1. Combustion chamber for a turbo-compressor unit associated with an internal combustion engine operable for reheating gases upstream of the turbine of said turbo-compressor unit, said combustion chamber being adapted to be supplied with fuel and at the same time by exhaust gases emerging from the engine and by fresh air taken through a bypass pipe connected between the outlet of the compressor and the inlet of said turbine of said turbo-compressor unit in bypass relation to the engine, said combustion chamber comprising a tubular element having a closed end and an open end, at least one fuel injector located toward the closed end of the tubular element, a primary air intake conduit adapted to communicate with said bypass pipe and having an outlet arranged to introduce fresh air into the tubular element in a combustion zone in the vicinity of its closed end, an exhaust gas intake conduit adapted to communicate with the exhaust outlet of the engine and having an outlet arranged to introduce the exhaust gases into the tubular element in the neighborhood of its open end at a mixing zone located downstream of said combustion zone and wherein the primary air or the products of combustion thereof with the fuel first meet the exhaust gases, said exhaust gas conduit outlet being oriented to effect said introduction with minimum load loss and in the direction of the open end of said tubular element, and a secondary air intake conduit adapted to communicate with said bypass pipe and having an outlet arranged to introduce fresh air into the tubular element downstream of the upstream end of said mixing zone, said secondary air conduit outlet being arranged to introduce fresh air in the form of a jet stream oriented in a direction transverse to the flow of the exhaust gases in said mixing zone such that the flow of secondary air into said mixing zone is opposed by the flow of the exhaust gases in said mixing zone whereby the interaction of the secondary air jet stream with the exhaust gas stream varies the ratio of primary air to secondary air entering said tubular element in accordance with the flow of exhaust gases into said mixing zone.

3,849,989

**INFLATABLE BARRIER FOR SUBSTANCES FLOATING  
ON WATER**

Paul Preus, Box 1002, Toms River, N.J. 08753

Filed May 25, 1973, Ser. No. 363,954

Int. Cl. E02b 3/04, 15/04

U.S. Cl. 61-1 F

4 Claims



1. A floating barrier for substances floating on water comprising:  
a floatation means including plurality of inflatable chambers hinged in end to end relationship, each of said chambers being divided into plural independent subchambers by flexible wall means disposed therein and liquid impervious skirt means depending from said floatation means to provide a liquid barrier below the water line thereof.

3,849,990

**ANTI-HEAVE PROTECTIVE SYSTEM**

Jacques Edouard Lamy, Fontenay-Aux-Roses, France, assignor to C. G. Doris (Compagnie Generale pour les Developpements Operationnels des Richesses Sous-Marines), Paris, France

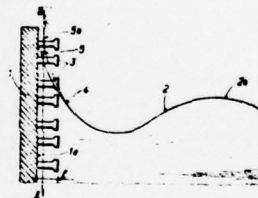
Filed Jan. 17, 1973, Ser. No. 324,305

Claims priority, application France, Jan. 18, 1972, 72.01560

Int. Cl. E02b 3/06

U.S. Cl. 61-3

11 Claims



1. Protective system against the heaving action of waves of water comprising a bulky obstacle means having a spreading-out surface and providing a substantially uninterrupted impingement area of substantial extent athwart the wave path and exposed to the impact of successive surges of the heave to induce along said spreading-out surface alternate ascending and descending motions of a mass of water of a thickness greater than a limit layer of water, and means providing a multiplicity of energy dissipating material elements distributed over and projecting in front of said spreading-out surface a distance sufficient to penetrate into said mass of water beyond said limit layer, said elements serving to slow down ascending and descending water motions and phaseshift the same with respect to the heave.

3,849,991

**IRRIGATION SYSTEM**

Paul Niedermeyer, Im Birkenbusch 7, 44 Munster, Germany

Filed Sept. 13, 1972, Ser. No. 288,774

Int. Cl. E02b 13/00

U.S. Cl. 61-13

2 Claims

1. A water system for a field comprising in combination:  
means, including main and perpendicular water afferent

Figure 3. Typical page from the *Official Gazette*.



Table 3 is presented only for the information of users familiar with the Patent Office classification system. The table does not include all of the classifications assigned to patents in the collection, just those classes examined most closely. The subclasses searched were too numerous to list. Patent attorneys and examiners using the bibliography for patent searches must realize that the criteria for patent selection were primarily functional, cutting across the Patent Office's classification system, so that the bibliography cannot be used to find all of the patents referenced to a particular classification code.

## V. INDEXING THE COLLECTION

### 1. The Keywords.

Since the Patent Office classification system could not be used to catalog the CERC collection, a system of keywording was developed as the basis for an index. The assignment of a keyword to each of the numerous detailed categories of inventions in the collection was impractical, consequently, as the following guide to the keyword system demonstrates, a keyword may cover several categories, including some unobvious ones. The following are not definitions of terms in the strictest sense but rather explanations of the topics included under each keyword, and taken as a whole, a list of all of the collection's topics.

ARTIFICIAL SEAWEED - Strands of synthetic material placed underwater in clumps or blankets to control scour.

ASPHALT - Bituminous material used as a binder or coating.

BAR PROTECTION - Formation or preservation of a bar or reef.

BATHYTHERMOGRAPH - A device for measuring the change of water temperature with depth, including air temperature just above the water surface.

BREAKWATER, CONCRETE - A concrete structure protecting a shore area, harbor, anchorage, or basin from waves, including large caissons and small low-cost units.

BREAKWATER, FLOATING - Moored buoyant units for protecting harbors and shore areas from wave attack.

BREAKWATER, PNEUMATIC - A bubble curtain for wave dissipation.

BREAKWATER, RUBBLE - A mound of soil or random-shaped and random-placed stones protected with a cover layer of selected stones or specially shaped concrete armor units, including structure cross sections useful as groins or jetties if the function was not specified in the patent.

BREAKWATER, STEEL FRAME - A wave-dissipating steel maze or a solid barrier of sunken ship sections or of steel caissons.

**BULKHEAD** - A structure or partition to retain or prevent sliding of the land. A secondary purpose is to protect the upland against damage from wave action.

**BUOY MOORING SYSTEM** - A method of anchoring a buoy or of fastening instruments to the anchor lines of a buoy.

**BUOY, INSTRUMENTED** - A buoy equipped with oceanographic instruments.

**CATHODIC PROTECTION** - Prevention of the corrosion or fouling of steel structures by electrical means.

**CHANNEL BARRIER** - A structure restricting tidal flow to permit energy production, storm protection, navigation, or water quality control.

**CHANNEL PROTECTION** - Control of siltation in harbors and navigation channels by means of structures or stationary dredging plants.

**COATING** - A protective paint, film, or covering or a method of application.

**COFFERDAM** - A temporary barrier allowing repair or construction of coastal structures under dry conditions.

**COLLISION PROTECTION** - Prevention of direct impact between ships and coastal structures.

**CONCRETE ARMOR UNIT** - A concrete object usually shaped to interlock, used in a protective outer layer on a coastal structure.

**CONCRETE BLOCK** - A concrete block used for coastal structures, usually a form of paving block used in revetments or of structural block used in seawalls.

**CONCRETE FORM** - A stationary or movable mold for concrete or grout.

**CORROSION MEASUREMENT** - Measurement of corrosion for research or control of cathodic protection systems.

**CORROSION PREVENTION** - Protection of metal coastal structures against corrosion damage.

**CURRENT MEASUREMENT** - Measurement of ocean or tidal current velocity or direction.

**DEPTH PRESSURE MEASUREMENT** - Determination of depth by measuring water pressure, usually to measure wave or tidal height or to control the depth of towed bodies.

**DREDGE INTAKE** - The sediment-gathering part of a dredge, including suction and cutterheads and the digging end of bucket ladders, but excluding seabed mining apparatus for sorting dredged sediment by size. When used with DREDGE PROPULSION, signifies that the intake is propelled independently of the dredging vessel. When used with PUMP, signifies that the intake includes a submerged pump.

**DREDGE LADDER CONTROL** - A mechanism or method of controlling the position of dredge bucket chains, ladders, and suction arms, including wave compensation devices.

**DREDGE PIPE** - Pipe for conveying dredge spoil, including flexible joints and floats.

**DREDGE PROPULSION** - A means of moving a dredge, including apparatus for placing spuds.

**DREDGE-SPOIL MEASUREMENT** - Determination of spoil concentration or volume, usually for control of the rate of dredging.

**DREDGE-SPOIL TRANSPORT** - A means of loading or unloading hopper barges or dredges, pumping spoil to a disposal site, or placing beach or land fill.

**DREDGE, CUTTERHEAD** - A suction dredge with a mechanical cutter.

**DREDGE, MECHANICAL** - A bucket ladder, bucket chain, dragline, grab, clamshell, or dipper dredge.

**DREDGE, SUBMERGED** - A dredge with pump, propulsion, and control means underwater, usually supported by the seabed, excluding seabed mining apparatus for sorting dredged sediment by size.

**DREDGE, SUCTION** - A plain suction, dustpan suction, or trailing suction dredge, with no mechanical excavating equipment.

**DUNE PROTECTION** - Formation or preservation of dunes or dikes.

**ELECTRICAL GENERATOR** - A source of electrical power.

**EMBEDMENT ANCHOR** - A propellant-actuated or vibration-driven plate anchor, a screw anchor, a driven or drilled-in-place anchor pile, or means for installing such anchors.

**FABRIC MAT** - A double-layered mattress of woven or nonwoven fabric or plastic film filled with sand or used as a form for grout or concrete, a single layer of such material used as filter cloth, or a web of synthetic material used to dissipate wave motion over a surface.

**FOULING PREVENTION** - Protection of coastal structures, including seawater intakes, against incrustation with marine organisms.



**FOULING REMOVAL** - Incrustation removal from watercraft.

**GABION** - A metal cage filled with rock and interconnected with others to form a revetment or bulkhead.

**GROIN** - A shore protection structure built on the bottom or suspended in the water at an angle to the shoreline to trap littoral drift or retard erosion of the shore.

**GROUTING** - Grout placement to underpin a coastal structure, to anchor a pile in the bottom or in a structure leg, or to seal a structure.

**HOPPER BARGE** - A barge or scow for transporting spoil or refuse, including bottom-dump barges and hopper dredges.

**HYDRAULIC MODEL BASIN** - A facility using three-dimensional wave or tide motion for educational demonstrations or model testing.

**ICE PROTECTION** - Prevention of damage to coastal structures by collision with floating floes or bergs, or by crushing or uplift by surrounding sheet ice.

**ICE STRUCTURE** - An offshore island of frozen material or a protective barrier of ice around an offshore structure.

**INSTRUMENT, LASER** - An oceanographic instrument using collimated beams of radiation.

**INSTRUMENT, RADIOISOTOPE** - An instrument using high-energy radiation, including means of measuring the radioactivity of samples, for handling irradiated sediment samples for tracer studies, or for X-ray photographing members of coastal structures.

**INSTRUMENT CABLE** - Waterproof power or data transmission cable for oceanographic instruments.

**INSTRUMENT DEPLOYMENT** - Placement of instruments or samplers at predetermined depths or locations using, for example, automatic depth-changing vehicles, free-fall probes, or buoy mooring cables.

**INSTRUMENT POWER SUPPLY** - A means of producing or delivering power to an instrument.

**INSTRUMENT RETRIEVAL** - Location and recovery of instruments, records, or samples.

**INSTRUMENT, AIRBORNE** - A remote-sensing instrument mounted in a tower, aircraft, or spacecraft, or a direct-measurement instrument in a projectile launched through the air.

**OFFSHORE ISLAND** - A manmade island of rubble, ice, or fill.

**OFFSHORE MOORING STRUCTURE** - An unprotected structure for mooring ships in the open sea, including buoys with patented anchoring systems, bottom-supported mooring platforms, and docks for service boats on offshore drilling platforms. Does not include mooring buoys without new anchoring systems.

**OFFSHORE PLATFORM ANCHOR** - An anchoring means specifically for resisting the uplift or lateral motion of a buoyant offshore structure.

**OFFSHORE PLATFORM, FIXED** - A platform founded in the bottom and supported by rigid legs.

**OFFSHORE PLATFORM, FLOATING** - A floating drilling or mooring platform with patented anchoring system. When used with **OFFSHORE PLATFORM, FIXED** or **OFFSHORE PLATFORM, JACK UP**, signifies that the platform either is moored to a fixed platform or is semisubmersible and may be sunk until supported by the bottom in shallow water.

**OFFSHORE PLATFORM, JACK UP** - A platform equipped with vertically movable legs that are lowered to the bottom to support the working deck above the water's surface, including devices for changing the vertical position of the legs.

**INSTRUMENT, SEABED IN SITU** - An instrument placed in or on the bottom for measuring the seabed's mechanical, electrical, or chemical properties in place.

**INSTRUMENT, TOWED** - Any oceanographic instrument towed through the water or across the bottom, except seismic surveying gear.

**JETTY** - A structure extending into a body of water at the mouth of a river or tidal inlet, designed to help deepen and stabilize a channel by preventing shoaling by littoral material and by directing and confining the stream or tidal flow.

**LOW-COST SHORE PROTECTION** - A shore protection structure, such as a revetment, seawall, or breakwater, that a private landowner can construct to protect beach-front property.

**OFFSHORE CAISSON** - A large hollow structure placed seaward of the breaker zone, including, for example, modular units for breakwaters, oversize legs for platforms, and rigid pollution barriers around platforms.

**OFFSHORE CONSTRUCTION** - Assembly of a coastal structure on or under the water's surface and placement of a structure on or in the bottom. Does not include means of transporting the structure to the construction site.

**OFFSHORE HARBOR** - A manmade structure not connected with the shore, forming an enclosure for mooring and protecting ships.

**OFFSHORE PLATFORM, LEG** - A support for the working deck of a fixed, floating, or jack-up platform.

**OFFSHORE PLATFORM, WALKING** - A platform that can be moved horizontally while supported by the bottom, including devices for changing the horizontal position of the legs.

**OFFSHORE STORAGE TANK, EMERGENT** - A tank with at least one storage chamber above or piercing the water's surface.

**OFFSHORE STORAGE TANK, SUBMERGED** - A tank with all storage chambers underwater, in some cases including an attached mooring and service structure protruding above the surface.

**OFFSHORE STRUCTURE FENDER** - A device for preventing or absorbing the impact between an offshore structure and ships, ice, or debris.

**PIER FENDER** - A device for absorbing the impact between a dock structure and a watercraft.

**PIER, FIXED** - A recreation or dock structure rigidly supported by piles or legs on the bottom or cantilevered out from the shore.

**PIER, FLOATING** - A dock structure supported by its buoyancy.

**PIER, MOBILE** - A fixed or floating dock structure designed to be dismantled, moved, and reassembled easily.

**PILE DOLPHIN** - A freestanding pile or cluster of piles, usually used in a harbor, designed to absorb impacts with watercraft.

**PILE DRIVER LEADS** - Guides for a pile or hammer, including means for controlling batter.

**PILE DRIVER, IMPACT** - A means of driving a pile by a succession of impacts, including drop hammers, steam hammers, and diesel hammers.

**PILE DRIVER, VIBRATORY** - A means of driving a pile by vibrating the pile at a resonant frequency, including "sonic drivers" and rotated eccentric weights.

**PILE DRIVER, WATER JET** - A means of driving a pile, or aiding other methods of pile driving, by using a jet of fluid to remove material below the pile.

**PILE-DRIVING SHOE** - A cutting shoe used at the bottom of concrete, wood, or thin steel piling to aid driving.

**PILE EXTRACTOR** - A means of removing a pile from the earth.

**PILE FOOTING** - A means of increasing a pile's bearing capacity by increasing the diameter of the bearing area in the surrounding soil.



**PILE LOAD MEASUREMENT** - Determination of pile capacity, driving resistance, or lateral load.

**PILE PLACEMENT** - Positioning piles for underwater driving or arranging piles in a specified pattern.

**PILE PROTECTION** - Prevention of damage to piles by ice, fouling, corrosion, or impact.

**PILE SECTION CONNECTION** - A means of splicing lengths of pile or joining adjacent sheet piling.

**PILE, CONCRETE** - A long concrete column placed in the ground or seabed as a support for an elevated deck or a foundation member, including cast-in-place piles, when specified for marine use, or any type of precast concrete pile or concrete-filled steel pipe pile.

**PILE, SHEET** - A pile with a generally slender flat cross section to be driven into the ground or seabed and meshed or interlocked with like members to form a diaphragm wall, cofferdam, or bulkhead. Pile material is signified by PILE, CONCRETE; PILE, STEEL; or PILE, WOOD.

**PILE, STEEL** - A long steel column placed in the ground or seabed as a support for an elevated deck, a foundation member, or a part of a protective barrier, including thin shell piles when specified for marine use, or any type of H or steel pipe piles.

**PILE, STRUCTURE CONNECTION** - A means of joining a pile to the structure it supports, for example, a pier deck or offshore platform jacket.

**PILE, WOOD** - A long timber column placed in the ground or seabed as a support for an elevated deck or a foundation member.

**POLLUTANT ABSORPTION** - Removal of liquid pollutants from the water's surface by absorbing them into a porous material or by adsorbing them onto a surface, the material or surface being in the form of particles, belts, or mats.

**POLLUTANT BURNING** - Control of combustion of floating liquid pollutants, either to encourage removal by burning or to extinguish accidental fires.

**POLLUTANT COALESCENCE** - Chemical treatment of a floating liquid pollutant to change its consistency, as a means to limit its spread, shrink the area of its slick, or aid removal of it from the water's surface.

**POLLUTANT COLLECTION** - Concentration of pollutants by mechanical means before removal from a body of water, including the use of inverted funnels to collect leakage from the seabed, of towed surface barriers to collect slicks, and of various forms of weirs or sluice gates to concentrate floating pollutants in collection barges.

**POLLUTANT DEBRIS** - Floating solid objects to be removed or excluded from an area.

**POLLUTANT DISPERSION** - Chemical treatment of a floating liquid pollutant to break up its slick and cause it to become emulsified with water.

**POLLUTANT MEASUREMENT** - Detection, identification, sampling, or measurement of marine pollutants, such as oil slicks, turbidity, or gases, by field equipment.

**POLLUTANT REMOVAL WATERCRAFT** - A navigable craft, usually a barge, equipped with apparatus for removing marine pollutants.

**POLLUTANT, MECHANICAL REMOVAL** - Removal of pollutants from the surface of a body of water by the use of rotating drums, conveyors, belts, or scoops.

**POLLUTANT, SUBMERGED BARRIER** - A barrier preventing the spread of pollutants from submerged leaks.

**POLLUTANT, SUCTION REMOVAL** - Removal of pollutants by pumping them directly from the surface of a body of water or from a collection barge, including the use of weirs to control the intake flow.

**POLLUTANT, SURFACE BARRIER** - A barrier preventing the spread of floating pollutants, usually a floating boom.

**POWER, SUBMERGED SOURCE** - A means of extracting power from ocean currents or from pressure or thermal gradients to drive electrical generators or samplers.

**POWER, TIDE** - A means of extracting power from impounded tidal flow, tidal currents, or the tidal rise and fall of the water's surface to drive electrical generators, pumps, or mechanical devices.

**POWER, WAVE** - A means of extracting power from wave motion to drive electrical generators, pumps, mechanical devices, or instruments.

**PUMP** - A means of moving a fluid or slurry under pressure, usually part of a dredge or means of extracting power from the ocean.

**REVTMENT** - A facing of stone, concrete blocks, grout-filled fabric mats or bags, or other material, built to protect a scarp, embankment, or shore structure against erosion by wave action or currents.

**SALINITY MEASUREMENT** - Determination of the salinity, conductivity, or acidity of water by field equipment.

**SAMPLER, BIOTA** - A means of collecting specimens of sea plant or animal life.

**SAMPLER, POWER SUPPLY** - A source of thrust for samplers such as driven or drilled corers, including explosives, vibratory devices, or implosive hydrostatic pressure chambers.

**SAMPLER, SEABED-DRILLED CORE** - Drilling apparatus taking sediment core samples from the seabed, usually coring bits with retainers for soft or granular material.

**SAMPLER, SEABED-DRIVEN CORE** - A means for taking sediment core samples from the seabed by thrusting a coring tube or box into the bed, using a propulsive device or the kinetic energy of a free fall to drive the corer.

**SAMPLER, SEABED GRAB** - A means of taking a disturbed surface sample from the seabed.

**SAMPLER, SURFACE** - A means for sampling matter, usually pollution or biota, floating on or near the water's surface.

**SAMPLER, SUSPENDED SEDIMENT** - A means for capturing samples of sediment suspended in or falling through water.

**SAMPLER, WATER** - A container taking a water sample at a preselected depth.

**SANDBAG** - A bag or tube of fabric or plastic film filled with sand, grout, or concrete to seal, underpin, or serve as a structural unit in a coastal structure.

**SAND FENCE** - A barrier for trapping windblown sand to prevent erosion and promote formation of dunes.

**SEABED CABLE PLOW** - A plow-shaped device for burying cable or flexible pipe in the seabed without excavating a trench.

**SEABED FOUNDATION** - A structure on or in the seabed for supporting a superstructure, such as oil- or water-process equipment, an offshore platform, a storage tank, or a breakwater.

**SEABED GRADER** - A remote-controlled submersible bulldozer or similar equipment for leveling a seabed site.

**SEABED MATERIAL PLACEMENT** - Placement of materials such as concrete, asphalt, sand, gravel, grout, or turbidity-reducing agents on the seabed as a layer or in a form.

**SEABED OIL, PROCESS STRUCTURE** - A structure fixed to the seabed for supporting or protecting submerged drilling, completion, or production equipment such as wellheads or gas-separation units.

**SEABED PIPELINE PLACEMENT** - Anchoring or burying a pipeline in the seabed, excluding methods for laying the pipeline itself from barges.



**SEABED PROPERTY MEASUREMENT** - Determination of seabed soil properties, such as bearing capacity, consolidation, specific gravity, or chemical composition, by measuring other properties, such as resistance to impact, sound transmission, electrical resistance, or radioactivity.

**SEABED SCOUR PROTECTION** - Prevention of the removal of underwater material at the base or toe of a coastal structure by waves and currents.

**SEABED SITE SURVEY** - A method of making a detailed survey of a small area, such as a construction site.

**SEABED SOIL TREATMENT** - Chemical or mechanical treatment of soil in the seabed to improve its qualities as construction or foundation material.

**SEABED TRENCHER** - A remote-controlled submersible excavator for forming trenches in the seabed, including towed units for burying pipeline.

**SEABED WATER, PROCESS STRUCTURE** - A structure fixed to the seabed for transporting or storing water, including cooling water intakes, sewer outfalls, or sewage storage tanks.

**SEAWALL** - A structure separating land and water areas, primarily designed to prevent erosion and other damage due to wave action.

**SEDIMENTATION MEASUREMENT** - Determination of sediment movement or accumulation, including tracer studies or the measurement of thin bottom layers.

**SEISMIC ACOUSTIC TRANSMITTER ARRAY** - A grouping of underwater seismic impulse sources, sometimes mounted in a three-dimensional framework.

**SEISMIC EXPLOSIVE ACOUSTIC TRANSMITTER** - An underwater seismic impulse source using a sudden discharge of pressure generated by igniting dynamite or a gas mixture, emitting a gas bubble, or producing an electric arc.

**SEISMIC HYDRAULIC ACOUSTIC TRANSMITTER** - An underwater seismic impulse source using the compression and flow properties of water to produce signal-generating water-hammer or turbulence effects.

**SEISMIC HYDROPHONE** - A single receiving unit for underwater seismic use.

**SEISMIC HYDROPHONE ARRAY** - A grouping of underwater seismic receivers, including one-dimensional arrangements within a streamer cable or three-dimensional arrangements of streamer cables or of hydrophones in a framework.

**SEISMIC IMPLOSIVE ACOUSTIC TRANSMITTER** - An underwater seismic impulse source using the sudden retraction of a piston or the collapse of a bubble of steam for implosion generation.

**SEISMIC RECORD PROCESSOR** - An electronic device for recording, deciphering, or printing signals from underwater seismic receivers.

**SEISMIC STREAMER CABLE** - A linear array of hydrophones attached to a towing cable, protective sheathing, and means for controlling the array's position.

**SEISMIC SURVEY METHOD** - A method of organizing and operating the components of an underwater seismic surveying system to use the equipment in different water depths or to detect features at specific depths in the seabed, including altering the instrument locations in a survey team's boats, the streamer cable arrangements, or the sequences of firing and recording cycles.

**SEISMIC VIBRATORY ACOUSTIC TRANSMITTER** - An underwater seismic signal source using an electrically, pneumatically, or hydraulically actuated vibrating transducer.

**SLOPE PROTECTION** - Stabilization of the faces of banks, dikes, or dunes to prevent sliding or erosion from runoff, including terracing or placement of mats, filter cloth, or other revetment materials.

**SMALL-CRAFT LAUNCHER** - A means for transferring watercraft to the water from storage on land and vice versa, including ramps, booms, or hoists.

**SMALL-CRAFT MOORING DEVICE** - A device for securing a watercraft in place in a harbor or dock, including mooring buoys, dock cleats, tie-off arrangements, or fender designs.

**SMALL-CRAFT PIER** - A fixed or floating dock structure for use in a small-craft harbor.

**SMALL-CRAFT SERVICE STRUCTURE** - A structure for storing or servicing small craft, including storage racks, drydocks, hull cleaning equipment, or sewage collection systems.

**SONAR, DEPTH SOUNDER** - A device or method using sound or light waves to determine the depth, and, in some cases, character of the seabed, and an associated piece of bathymetric mapping equipment, such as a recorder.

**SONAR, SIDE LOOKING** - A depth-measuring device or method using sound waves projected to the side of the survey track, at an oblique angle to the bottom, to detect the relief of the seabed, and, in some cases, associated equipment for producing bathymetric contour maps.

**STRUCTURE INSPECTION** - Detection of damage to coastal structures, including the X-ray photography or sonography of piles or platform legs to detect fouling, corrosion or fatigue damage, or the surveying of rubble structures to detect the removal of material.

**STRUCTURE REPAIR** - Correction of damage to coastal structures, in most cases replacement of damaged sections of a pile.

**TIDAL ESTUARY WATER LEVEL** - Control of tidal flow and water elevation in the part of a river affected by tides to permit navigation, energy production, or storm protection.

**TIDAL ESTUARY WATER QUALITY** - Control of tidal flow in the part of a river affected by tides to restrict the upstream movement of saltwater or to flush polluted water from stagnant parts of the estuary.

**TIDAL INLET** - Coastal structures that may be used in the short waterway between a tidal bay or lagoon and the parent body of water or at the mouth of a river where it flows into a large tidal body of water.

**TIDAL MEASUREMENT** - Determination of tidal height, current velocity, and period.

**TIRES** - Scrap tires used as structural units in coastal structures such as floating breakwaters or revetments.

**TOW WINCH CONTROL** - Operation of a tow winch to launch, retrieve, or control the depth of a towed instrument.

**TOWED BODY DEPTH CONTROL** - Operation of position control devices on towed instruments which, for example, regulate buoyancy of seismic streamer cables or manipulate diving planes on towed vehicles.

**TOWED VEHICLE** - A body containing or attached to a towed instrument to provide streamlining or buoyancy, or to control position, acceleration, or vibration.

**TOWING CABLE** - Cable for towing instruments, usually equipped with electrical conductors and fairings.

**WATER PLANT REMOVAL** - Removal of shallow-water weeds, to improve navigation or recreation in a body of water, by cutterhead dredges with special apparatus for cutting and shredding plants or by plant-harvesting watercraft with digging jets for uprooting plants and conveyors for removing them from the water.

**WAVE ABSORBER BEACH** - A wave-absorbing barrier or mattress to be placed in a model basin or on a beach face, a typical mattress being of loosely woven or perforated material which, unlike a revetment, does not cover the whole area with durable material.

**WAVE FLUME** - A facility using wave motion for research, educational demonstrations, or recreational activities.

**WAVE GENERATOR** - A means for making waves in a flume or model basin.



WAVE MEASUREMENT - Determination of wave height, force, period, and direction using, for example, stationary electronic or pressure gages, acceleration-measuring buoys, or remote-sensing radar or sonar equipment.

WIND MEASUREMENT - Determination of wind velocity and direction near the sea surface, including the use of anemometers on instrumented buoys.

WOOD PRESERVATIVE - A treatment for preventing rot or fouling damage to wood used in the coastal zone.

## 2. Assignment of Keywords to Patents.

The keywords were defined using the "Glossary of Terms" in Volume III of the SPM as a guide, and were assigned consistently to all patents having, according to the SPM definitions, the same functional properties. In many cases this practice led to the assignment of keywords that conflicted with the patent title. As an example, in coastal engineering a jetty is technically a barrier built at an inlet to prevent shoaling at a harbor entrance by channeling tidal flow and retarding sand movement along adjacent beaches. The term is also commonly used to describe a groin, a similar structure designed to hold or accumulate sand on a beach to prevent erosion. For this collection, a patent titled "jetty," but describing a shore protection structure, was keyworded "groin" not "jetty." Problems also arise when foreign technical terms are translated into English. For instance, in many French patents, such as patent 3,849,990 described on the example page in Figure 3, the term "heave" is used for "surf" or "waves."

Selecting keywords for the patents involved a compromise between keeping the subject index a manageable size and making it thorough. To focus attention on just the major points in each patent, words were picked which described the contents of first, the claims, and second, the other parts of the text. Problems were encountered whenever an inventor proposed a design for an entire system, then included only a small component in the claims. An example is a patent which described in detail a design for a floating small-craft pier while just the fenders were covered by the claims. Besides "pier fender," the keywords "pier, floating" and "small-craft pier" were added to represent the material in the text. Since only the claims may be of interest to patent attorneys and examiners, and the rest of the text may be valuable to engineers as an explanation of the claims and as general technical material, the indexing system, based on both the claims and the text, will provide more patents than may be useful in researching a patent application, but less than all that may be of value in searching for literature.

## VI. THE BIBLIOGRAPHY

### 1. Information in the Annotations.

Volume I of the appendix includes the annotations for selected patents 3,295,231 to 3,551,369, issued during the years 1967 to 1970. Volume II

covers patents 3,552,131 to 3,781,778 and reissued patents Re. 27,090 to Re. 27,640, issued during 1971 to 1973. Volume III includes patents 3,782,127 to 3,999,566 and reissued patents Re. 28,232 to Re. 28,989, issued from 1974 to 1976. Example annotations are presented for original patents in Figures 4, 5, and 6, and for reissued patents in Figures 7 and 8. Figure 4 is a page from Volume I containing annotations for patents issued on November 5 and 12, 1968. Figures 5 and 6 are pages from Volume II of the appendix with annotations from the dates shown in the figures. Figures 7 and 8 are pages from Volume III of the appendix containing annotations for reissued patents, including reissued versions of two of the original patents described in Figures 5 and 6.

As illustrated, annotations for new patents are listed in numerical order, grouped by the weekly date of issue. Each annotation includes information identifying the patent and inventor, classifying the patent, and briefly describing the invention. The patent number, the title, and information on the inventor, assignee, patent application, classification, and number of claims were copied directly from the *Official Gazette*, unless obvious spelling errors made the title confusing, or a "Certificate of Correction" with the patent document indicated that printing errors in the inventor's name needed to be corrected. As can be seen by comparing Figures 4 and 5, the format changes slightly between 1968 and 1969. Before 1969 the "original U.S. classification" is printed in parentheses after the abbreviation "Cl." For 1969 and the following years the parentheses are deleted, the abbreviation "U.S. Cl." is used, and all the assigned international classifications are listed after "Int. Cl." "Cross-reference U.S. classifications," listed after the abbreviation "U.S. Cl. X.R.," are added to the annotations for those patents assigned them from December 10, 1968, onward. All classification codes are those assigned to the patents at the time of issue and do not reflect changes caused by revisions in the classification system.

The description of the invention includes the abstract or, if the patent had no abstract, a representative claim with the claim number, copied from the *Official Gazette* or patent with no corrections of printing errors. The annotation at the top in Figure 4 illustrates the use of a claim. In addition, for those patents containing figures, a figure copied from the *Official Gazette* is included. As shown in the annotation at the top of Figure 4, if the patent contains no figures the fact is noted in the annotation. Another item in the annotation is the keywords assigned to each patent for this bibliography. If the patent was reissued before the end of 1976, a reference to the reissued patent number also is included in the annotation, as illustrated by the annotations at the top of Figure 5 and at the bottom of Figure 6.

Annotations for reissued patents are listed after the original patents in Volumes II and III. No reissued patents were chosen for the collection from the period covered by Volume I. Due to the small number of reissued patents, the date of reissue for each is given in the annotation, along with information on the original patent and on the application for reissue. If the original patent had an abstract, the entire text of the abstract is

3,409,525

**PROCESS FOR REDUCING CORROSION**

Charles W. Taylor, Jr., Akron, and Daniel T. Conrad, Cuyahoga Falls, Ohio, assignors to The Goodyear Tire & Rubber Company, Akron, Ohio, a corporation of Ohio

No Drawing. Filed May 24, 1965, Ser. No. 458,436

8 Claims. (Cl. 204—147)

1. In the cathodic process of protecting ferrous articles from corrosion the improvement which comprises subjecting a ferrous article to a treatment that forms a phosphate coating on the surface of the article, then coating it with a fused resin, and then cathodically protecting said article.

Keywords: Cathodic protection; Corrosion prevention

No Figure

3,409,871

**ELIMINATION OF MULTIPLE EVENTS ON SEISMOGRAMS OBTAINED AT WATER-COVERED AREAS OF THE EARTH**

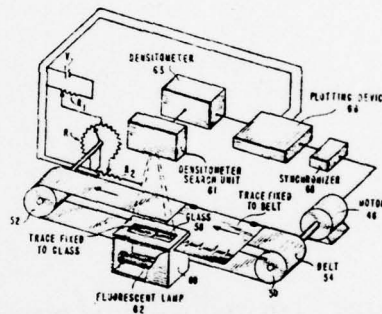
Harland H. Heffring, Calgary, Alberta, Canada, assignor to Esso Production Research Company, a corporation of Delaware

Filed Oct. 12, 1966, Ser. No. 586,075

7 Claims. (Cl. 340—15.5)

Ring events are eliminated from a trace of a reproducible seismogram taken at marine locations by adjustably attenuating electrical signals produced from a trace, delaying the trace by an amount equal to the seismic wave travel time through the water layer beneath the source, and adding the original signal to the undelayed and unattenuated signal. This process is repeated using a delay equal to the travel time of waves in the water layer beneath the seismic wave detector. The appropriate attenuation and time delay is determined by autocorrelation of traces produced by vertically traveling seismic waves at the ends of a geophone spread.

Keywords: Seismic record processor



NOVEMBER 12, 1968

3,410,097

**PILE CAPPING MECHANISM**

Edward M. Young, 90 Gregory Ave., West Orange, N.J. 07052

Filed Mar. 21, 1966, Ser. No. 536,022

7 Claims. (Cl. 61—53)

A pile capping mechanism for rehabilitating the tops of old piles and also to provide concrete caps for new piles, the mechanism having a bottom member or portion of integral overlapping flexible fingers directed inwardly and angularly upwardly and of such length as to provide a central opening smaller than the pile and a casing extending from the bottom. The mechanism may provide U shaped side edges for the casing which are interengaged by contracting the casing and including internal braces when assembled to prevent inadvertent contraction of the casing and disengagement of the edges.

Keywords: Concrete form; Pile, wood; Structure repair

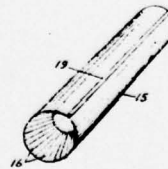


Figure 4. Typical annotations for original patents issued before 1969.



AUGUST 31, 1971

3,601,999

**METHODS OF GROUTING OFFSHORE STRUCTURES**  
Horace W. Olsen, 2038 North Blvd., Houston, Tex., and Max  
Bassett, P.O. Box 808 South, South Houston, Tex.  
Filed Sept. 18, 1969, Ser. No. 858,951  
Int. Cl. E02b 17/00; E02d 5/24

U.S. Cl. 61-46

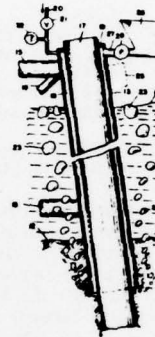
1 Claim

Keywords: Grouting; Offshore construction;  
Pile, structure connection

U.S. Cl. X.R. 61-54

See: Re. 28,232

Compressed air is introduced into an annular space existing between the jacket and piling in the legs of an offshore structure, so that water is expelled from the annular space through the lower end of the jacket and grouting material is then introduced into the annular space. The introduction of compressed air and grouting material is effected from above the waterline, thus avoiding the necessity of performing the grouting operation by divers at the sea bed.



3,602,000

**REINFORCED STEEL PIPE PILING STRUCTURE**  
Homayoun Joe Meheen, Box 515, Rte. 3, Golden, Colo.  
Continuation-in-part of application Ser. No. 712,187, Mar.  
11, 1968, now Patent No. 3,403,707, dated July 16, 1969.  
This application Sept. 19, 1969, Ser. No. 859,403  
Int. Cl. E02d 5/40, 5/58; E04c 3/34

U.S. Cl. 61-46

10 Claims

Keywords: Offshore construction; Offshore  
platform, leg; Pile, concrete;  
Pile, steel; Structure repair

U.S. Cl. X.R. 52-223; 61-53; 61-53.52;  
61-56

Reinforcement for steel pipe piles and piling structure such as that supporting an offshore oil platform, which has deteriorated and lost its strength. The pile is reinforced in situ by cutting an access opening into its interior, or cutting such an access opening through the pile to communicate with the interior of a steel bracing pipe in the structure, and introducing a partially prestressed and partially reinforced concrete column inside the steel shell.

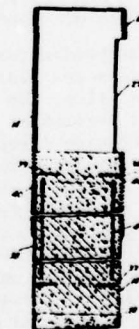


Figure 5. Typical annotations for original patents issued since 1969.

3. 1973  
3,708,070 to 3,781,778

JANUARY 2, 1973

**3,708,070  
OIL SKIMMER**

Edwin A. Bell, Lake Charles, La., assignor to Cities Service Oil Co.

Filed Oct. 2, 1970, Ser. No. 77,596  
Int. Cl. C02b 9/02

U.S. Cl. 210-242

6 Claims

In order to recover surface oil from a body of water a floating oil skimmer barge is provided with a series of compartments, beginning at the prow of the barge, inflow to each compartment being effected over a respective floating baffle pivotally mounted at its bottom edge to swing into its compartment to a depth determined by the pressure differential across the baffle. Position of the baffle is controlled by pumping water at controlled rates from the bottom of the downstream end of each compartment to thereby cause an effective surface flow between compartments. Surface oil builds up in depth at the downstream end of the last compartment and is collected, substantially free of water, in a recovery chamber which is also provided with a floating baffle and from which oil is pumped at controllable rates.

Keywords: Pollutant collection; Pollutant removal watercraft; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



JANUARY 9, 1973

**3,708,982  
SYSTEM AND BARRIER FOR CONTAINING AN OIL  
SPILL**

Thomas Nicholas Blockwick, McLean, Va., assignor to Ocean Systems, Inc., New York, N.Y.

Filed Oct. 21, 1970, Ser. No. 79,997  
Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

23 Claims

A system for containing an oil spill comprising a plurality of barrier modules each composed of a composite structure having a buoyant upper section and a water absorbing lower section which represents concurrently the sole ballast for said upper section and the subsurface barrier for the module.

Keywords: Pollutant, surface barrier

U.S. Cl. X.R. 61-5; 114-.5F

See: Re. 28,966

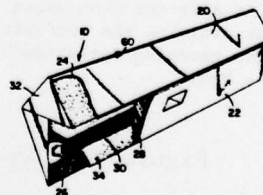


Figure 6. Additional examples of annotations for original patents.

4. Reissued Patents  
1974 to 1976  
Re. 28,232 to Re. 28,989

Note: Matter enclosed in heavy brackets [] appears in the original patent but forms no part of the reissued specification; matter printed in italics indicates the additions made by reissue.

Re. 28,232

METHODS OF GROUTING OFFSHORE  
STRUCTURES

Max Bassett, Houston, Tex., and Horace W. Olsen, deceased, late of Houston, Tex., by Magdalene M. Olsen, executrix, Houston, Tex., assignors to C. Nelson Shields, Jr., trustee

Original No. 3,601,999, dated Aug. 31, 1971, Ser. No. 858,951, Sept. 18, 1969. Application for reissue July 11, 1973, Ser. No. 378,196

Int. Cl. E02b 17/00; E02d 5/24

U.S. Cl. 61—46

15 Claims

Reissued Nov. 5, 1974

Keywords: Grouting; Offshore construction;  
Pile, structure connection

U.S. Cl. X.R. 61-53.52; 61-53.6; 61-54

A method for grouting the annulus between the jacket and piling in the legs of an offshore structure in which air is introduced to expel water from the lower end of the annulus, and the annulus is then filled from the top with grouting material. Air pressure may be maintained in the annulus sufficient to prevent ingress of water through the lower end of the jacket while grouting material is being introduced.

[Compressed air is introduced into an annular space existing between the jacket and piling in the legs of an offshore structure so that water is expelled from the annular space through the lower end of the jacket and grouting material is then introduced into the annular space. The introduction of compressed air and grouting material is effected from above the waterline, thus avoiding the necessity of performing the grouting operation by divers at the sea bed.]

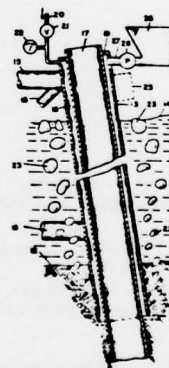


Figure 7. Typical annotations for reissued patents.



Re. 28 332  
**METHOD AND APPARATUS FOR PREVENTING  
 ICE DAMAGE TO MARINE STRUCTURES**

Joseph F. Schirtzinger, Pasadena, Calif., assignor to  
 Sea-Log Corporation, Pasadena, Calif.

Original No. 3,669,052, dated June 13, 1972, Ser. No.  
 46,273, June 15, 1970. Application for reissue Oct.  
 25, 1973, Ser. No. 409,747

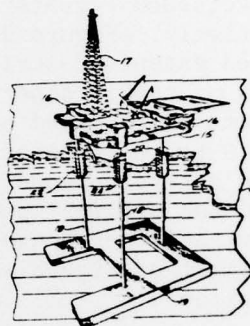
Int. Cl. B63h 35/08  
 U.S. Cl. 114—.5 R 15 Claims

A marine well drilling platform or the like having legs  
 extending to the sea floor is protected from ice floes by  
 comminuting devices at the water line for breaking the ice  
 and thereby preventing crushing or overturning of the  
 platform. The comminuting devices employ high velocity  
 impacts against the ice to cause its fracture into chips as  
 distinguished from cutting action. Rapidly rotating or re-  
 ciprocating mechanisms with large "teeth" for making im-  
 pact engagement with the ice are employed in separate  
 embodiments. Comminuting devices mounted for sweep-  
 ing adjacent a mooring buoy in one embodiment open a  
 path through an ice floe for protecting the buoy and a ship  
 moored at the buoy.

Reissued Feb. 11, 1975

Keywords: Ice protection; Offshore mooring  
 structure; Offshore platform,  
 fixed; Offshore platform, leg;  
 Offshore structure fender

U.S. Cl. X.R. 9-8R; 61-1; 61-46; 114-42;  
 299-24



Re. 28,966  
**SYSTEM AND BARRIER FOR CONTAINING AN OIL  
 SPILL**

Thomas Nicholas Blockwick, McLean, Va., assignor to Ocean  
 Systems, Inc., Reston, Va.

Original No. 3,708,982, dated Jan. 9, 1973, Ser. No. 79,997,  
 Oct. 21, 1970. Application for reissue Jan. 24, 1974, Ser.  
 No. 436,146

Int. Cl. E02b 15/04  
 U.S. Cl. 61-1 F 19 Claims

A system for containing an oil spill comprising a plu-  
 rality of barrier modules each composed of a compos-  
 ite structure having a buoyant upper section and a  
 water absorbing lower section which represents con-  
 concurrently the sole ballast for said upper section and  
 the subsurface barrier for the module.

Reissued Sept. 21, 1976

Keywords: Pollutant, surface barrier

U.S. Cl. X.R. 61-5; 114-.5F; 210-83

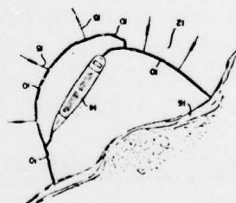


Figure from entry for original patent

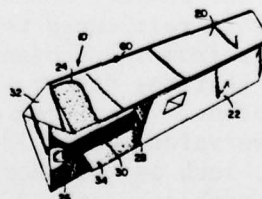


Figure 8. Additional examples of annotations for reissued patents.

presented with any deletions in brackets. Additions, ranging from single words to complete new abstracts, are in italics. The annotations for patent 3,601,999 at the top of Figure 5 and for its reissue, Re. 28,232, in Figure 7 demonstrate the way changes in the abstract are designated. The annotations for patent 3,708,982 at the bottom of Figure 6 and for its reissue, Re. 28,966 at the bottom of Figure 8 show how a change in illustrative figure is described.

Several original patents annotated in Volumes I or II were reissued during periods covered by the other volumes. Information on these reissued editions is included in Volumes I and II as the sections "Referenced Reissued Patents" and "Additional Referenced Reissued Patents," respectively. Figure 9 is the complete section from Volume II. The reissued patents described in these sections are not included in the indexes of their respective volumes. As can be seen from comparison of the notes on reissued patents Re. 28,232, Re. 28,332, and Re. 28,966 in Figure 9 to the annotations for these reissued patents in Figures 7 and 8, each entry includes, in a format similar to the annotations, information on the original patent, the application for reissue, the date of reissue, and the changes in the classification codes or keywords. If an abstract or figure was added or revised, the entry includes the new information.

## 2. Use of the Title List.

The list of titles and numbers in each volume, arranged in numerical order with reissued patents at the end of the list, may be used to determine whether a patent is in the collection when the patent number is available from an outside source. Figure 10 is an example page of the title list from Volume III. As an example of its use, assume that an article on floating breakwaters mentions a patent 3,991,576. As discussed above, this number falls in the range covered by Volume III. Refer to the title list in Volume III and find, as shown in Figure 10, that patent 3,991,576 is in the collection.

## 3. Use of the Subject Index.

The subject index in each volume is used to find patents related to a chosen topic. To enter the index, first find the keywords related to the topic by referring to the listing of keyword definitions in this report or in Section II of the first volume of the appendix. Next, search the subject index of each volume to find the lists of information on patents referenced to the selected keywords. Figures 11 and 12 are excerpts from the subject indexes of Volumes III and I, respectively. Notice that the number, title, and other assigned keywords are given for each patent. The other assigned keywords are included for their descriptive value to aid identification of the many patents with general titles, such as "Offshore Structure," or with titles using ill defined terms, such as "Jetty." To select interesting patents, examine the title and the other keywords for each patent listed under a chosen keyword; then, for the most promising patents, use the patent numbers to find the

## 5. Additional Referenced Reissued Patents.

The following reissued patents published between the end of 1973 and the end of 1976 are revisions of original patents in this volume. These reissued patents are not included in the annotations or subject index in this volume. Listed below are key information referencing the reissued patent to the original patent and new material added to or replacing information in this volume's annotation for the original patent. Complete annotations for these reissued patents are in the volume for the years the revisions were published.

### Re. 28,232

#### METHODS OF GROUTING OFFSHORE STRUCTURES

Max Bassett, Houston, Tex., and Horace W. Olsen, deceased, late of Houston, Tex., by Magdalene M. Olsen, executrix, Houston, Tex., assignors to C. Nelson Shields, Jr., trustee

Original No. 3,601,999, dated Aug. 31, 1971, Ser. No. 858,951, Sept. 18, 1969. Application for reissue July 11, 1973, Ser. No. 378,196

Int. Cl. E02b 17/00; E02d 5/24  
U.S. Cl. 61—46 15 Claims

Reissued Nov. 5, 1974

Added U.S. Cl. X.R. 61-53.52; 61-53.6

*A method for grouting the annulus between the jacket and piling in the legs of an offshore structure in which air is introduced to expel water from the lower end of the annulus, and the annulus is then filled from the top with grouting material. Air pressure may be maintained in the annulus sufficient to prevent ingress of water through the lower end of the jacket while grouting material is being introduced.*

[Compressed air is introduced into an annular space existing between the jacket and piling in the legs of an offshore structure so that water is expelled from the annular space through the lower end of the jacket and grouting material is then introduced into the annular space. The introduction of compressed air and grouting material is effected from above the waterline, thus avoiding the necessity of performing the grouting operation by divers at the sea bed.]

### Re. 28,332

#### METHOD AND APPARATUS FOR PREVENTING ICE DAMAGE TO MARINE STRUCTURES

Joseph F. Schirtzinger, Pasadena, Calif., assignor to Sea-Log Corporation, Pasadena, Calif.

Original No. 3,669,052, dated June 13, 1972, Ser. No. 46,273, June 15, 1970. Application for reissue Oct. 25, 1973, Ser. No. 409,747

Int. Cl. B63b 35/08  
U.S. Cl. 114—5 R 15 Claims

Reissued Feb. 11, 1975

Added Keyword: Offshore platform, leg

### Re. 28,966

#### SYSTEM AND BARRIER FOR CONTAINING AN OIL SPILL

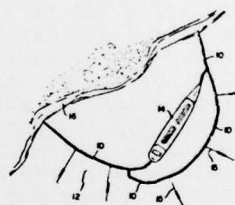
Thomas Nicholas Blockwick, McLean, Va., assignor to Ocean Systems, Inc., Reston, Va.

Original No. 3,708,982, dated Jan. 9, 1973, Ser. No. 79,997, Oct. 21, 1970. Application for reissue Jan. 24, 1974, Ser. No. 436,146

Int. Cl. E02b 15/04  
U.S. Cl. 61—1 F 19 Claims

Reissued Sept. 21, 1976

Added U.S. Cl. X.R. 210-83



### Re. 28,989

#### ELECTROMAGNETIC WATER CURRENT METER

Vincent J. Cushing, 9804 Hillridge Drive, Kensington, Md. 20795

Original No. 3,759,097, dated Sept. 18, 1973, Ser. No. 68,674, Sept. 1, 1970. Application for reissue Dec. 10, 1974, Ser. No. 531,418

Int. Cl. G01F 1/58  
U.S. Cl. 73—194 EM 22 Claims

Reissued Oct. 5, 1976

Figure 9. Notes on some of the reissued editions of original patents annotated in Volume II.



3989951 WAVE ENERGY POWER GENERATING BREAKWATER  
 3990034 TOWABLE VLF SONAR PROJECTOR  
 3990247 SYSTEM OF STRUCTURES TO RESIST HYDRODYNAMIC FORCES  
 3990252 EARTHWORKS CONSOLIDATION SYSTEM  
 3990253 METHOD FOR CONSTRUCTING AN ICE PLATFORM  
 3990254 MARINE STRUCTURE FOR OFFSHORE ACTIVITIES  
 3990377 SELF-PROPELLED MACHINE FOR SEA-BED WORK  
 3990379 DREDGING APPARATUS  
 3990386 PAIRED MULTI-STRENGTH MEMBER TOWCABLE AND ASSOCIATED SEQUENTIAL  
 LOAD DISTRIBUTION SYSTEM  
 3990970 ABSORBENT PRODUCTS FOR HYDROCARBONS  
 3990975 RIGGING SYSTEM FOR AN ENDLESS OIL HOP  
 3991563 HYDROELECTRIC POWER PLANT  
 3991576 FLOATING BREAKWATER  
 3991581 METHOD AND APPARATUS FOR HANDLING PILING AND ANCHORING AN OFFSHORE TOWER  
 3991582 ROTATING-BUMPER FENDER SYSTEM  
 3991623 MARINE INSTRUMENT  
 3991695 WATERCRAFT DOCKING  
 3992105 METHOD AND APPARATUS FOR REMOTE SALINITY SENSING  
 3992272 SUBMERGED OFFSHORE PLATFORM JOINT PROTECTION  
 3992292 MOVING BELT-TYPE OIL SKIMMER WITH PROPULSION INDUCED FLOW,  
 METHOD AND APPARATUS  
 3992735 FLOTATION RING FOR DREDGE PIPE LINES  
 3992737 SUSPENSION SYSTEM FOR UNDERWATER EQUIPMENT  
 3992881 APPARATUS TO GENERATE HIGH PRESSURE AIR FROM WATER  
 3993913 TIDEWATER POWER SYSTEM  
 3994082 AIR OPERATED DREDGING APPARATUS  
 3994134 APPARATUS FOR POWER GENERATION IN DEEP SEAWATER  
 3994629 MECHANISM FOR TAPPING THE SURF ENERGY  
 3994795 SACRIFICIAL ANODE  
 3995160 METHOD AND APPARATUS FOR OBTAINING ELECTRICAL POWER FROM SEA WATER  
 3995434 WAVE DISSIPATING WALL  
 3995437 SHOCK ABSORBING ARRANGEMENT FOR A MARINE STRUCTURE  
 3995438 METHOD FOR INCREASING THE LOAD CARRYING CAPACITY  
 AND PULL-OUT RESISTANCE OF HOLLOW PILES  
 3995439 DEVICE FOR EMBEDDING OBJECTS SUCH AS CONTINUOUS PIPES INTO WATER BOTTOMS  
 3995480 THERMAL SENSOR FOR MEASUREMENT OF OCEAN CURRENT DIRECTION  
 3996134 METHOD OF DISPERSING OIL IN WATER  
 3996138 MARINE LIFE PROTECTOR  
 3996678 FREE-FALL GRAB  
 3996754 MOBILE MARINE DRILLING UNIT  
 3996756 METHOD AND APPARATUS FOR SUPPORTING A DRILLING PLATFORM  
 ON THE OCEAN FLOOR  
 3996757 APPARATUS FOR PROTECTING METALLIC STRUCTURAL ELEMENTS AGAINST CORROSION  
 3996794 DIFFERENTIAL DEPTH INDICATOR  
 3996876 MARINE LINE SECURING APPARATUS  
 3997022 DEVICE FOR GENERATING ACOUSTIC WAVES BY IMPLSION  
 3998060 BARRIER FOR WATER CARRIED POLLUTANTS  
 3998061 FORMATION OF CAVITIES IN THE BED OF A SHEET OF WATER  
 3998062 SEA FLOOR SUPPORTED STRUCTURES WITH CRUSHABLE SUPPORT  
 3998063 METHOD AND APPARATUS FOR REMOVING CONSTRUCTION PILES  
 3998064 SURFACE PILE DRIVING APPARATUS AND METHOD  
 3996733 DETERGENT COMPOSITION FOR DISPERSING OIL SPILLS  
 3999312 WATER JET TYPE UNDERWATER GROUND EXCAVATOR  
 3999313 TOWED SLED FOR DEEP-SEA PARTICLE HARVEST  
 3999395 SUPPORT ARRANGEMENT FOR A CONSTRUCTION  
 3999397 MODULAR DOCK SYSTEM  
 3999399 PROTECTIVE GUARD MEANS FOR WOOD PILING AND A METHOD  
 OF INSTALLING SAME UNDER DRY WORKING CONDITIONS  
 3999497 SHOCK-ABSORBING BUFFER FOR BOARDING FENDER  
 3999566 METHOD AND APPARATUS FOR DISCHARGING OVERBOARD EXCESS WATER  
 FROM HOPPER OF HOPPER SUCTION DREDGER OR BARGE OR SCOW  
 RE28232 METHODS OF GROUTING OFFSHORE STRUCTURES  
 RE28332 METHOD AND APPARATUS FOR PREVENTING ICE DAMAGE TO MARINE STRUCTURES

Figure 10. Page from title list of Volume III.

3984989 MEANS FOR PRODUCING SUBAQUEOUS AND OTHER CAST-IN-PLACE CONCRETE STRUCTURES IN SITU. OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ; OFFSHORE CONSTRUCTION ; PILE, CONCRETE ; SEAWALL ; STRUCTURE REPAIR

**BREAKWATER, FLOATING**

3785159 ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION OF WAVE-INDUCED WATER MOVEMENTS. OTHER KEYWORDS: BREAKWATER, STEEL FRAME ; POLLUTANT COLLECTION ; POLLUTANT DISPERSION ; POLLUTANT, SURFACE BARRIER ; POWER, WAVE

3791150 FLOATING BREAKWATER FOR ATTENUATING SEAS

3800543 OFFSET BREAKWATER CONFIGURATION

3846990 FLOATING WAVE BARRIER  
OTHER KEYWORDS: BUOY MOORING SYSTEM

3848419 FLOATING WAVE BARRIER  
OTHER KEYWORDS: BUOY MOORING SYSTEM

3863455 FLOATABLE BREAKWATER

3864920 FLOATING BREAKWATER

3877233 FLOATING BREAKWATER SYSTEM  
OTHER KEYWORDS: LOW-COST SHORE PROTECTION

3884042 FLOATING BREAKWATER  
OTHER KEYWORDS: LOW-COST SHORE PROTECTION ; TIRES

3908384 BREAKWATERS FOR LONG, SHORT AND/OR COMPLEX WATER WAVES  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME

3952521 PORTABLE FLOATING WAVE TRIPPER  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME

3953977 DEVICE FOR DAMPING WAVES  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME ; TIRES

3969901 FLOATING BREAKWATERS

3971221 BREAKWATER SYSTEM FOR CREATING ARTIFICIAL SANDBARS  
OTHER KEYWORDS: BAR PROTECTION

3991576 FLOATING BREAKWATER

**BREAKWATER, PNEUMATIC**

3803849 METHOD AND APPARATUS FOR DAMPING WAVE ACTION

3822555 MARINA PROTECTIVE WAVE BREAKER

**BREAKWATER, STEEL FRAME**

3785159 ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION OF WAVE-INDUCED WATER MOVEMENTS. OTHER KEYWORDS: BREAKWATER, FLOATING ; POLLUTANT COLLECTION ; POLLUTANT DISPERSION ; POLLUTANT, SURFACE BARRIER ; POWER, WAVE

3835651 LITTORAL FLOW TRAP OR BASIN  
OTHER KEYWORDS: BULKHEAD ; GROIN ; SEAWALL

Figure 11. Page from subject index of Volume III.

PILE, WOOD

- 3295332 PROTECTIVE COVER FOR BUTT ENDS OF TIMBER PILES  
OTHER KEYWORDS: CONCRETE FORM ; PILE PROTECTION
- 3306054 SKIRT TYPE PILE DRIVING POINT  
OTHER KEYWORDS: PILE-DRIVING SHOE ; PILE, STEEL
- 3307362 POSTING PILING  
OTHER KEYWORDS: PILE SECTION CONNECTION ; STRUCTURE REPAIR
- 3321924 PROTECTION OF SUBMERGED PILING  
OTHER KEYWORDS: COATING ; PILE PROTECTION ; WOOD PRESERVATIVE
- 3331211 PILE INSPECTION AND REPAIR CELL  
OTHER KEYWORDS: PILE, CONCRETE ; STRUCTURE INSPECTION ;  
STRUCTURE REPAIR
- 3333427 BOOT FOR PILOT TIMBER PILE  
OTHER KEYWORDS: PILE-DRIVING SHOE
- 3338058 ADJUSTABLE COMPOSITE FORM  
OTHER KEYWORDS: CONCRETE FORM ; PILE, CONCRETE ; PILE, STEEL ;  
STRUCTURE REPAIR
- 3377808 CAP ASSEMBLY FOR PILE SHELL  
OTHER KEYWORDS: CONCRETE FORM ; PILE, STRUCTURE CONNECTION ;  
STRUCTURE REPAIR
- 3379020 DOLPHIN OR MARINE CONSTRUCTION  
OTHER KEYWORDS: COLLISION PROTECTION ; OFFSHORE CONSTRUCTION ;  
PILE DOLPHIN
- 3410097 PILE CAPPING MECHANISM  
OTHER KEYWORDS: CONCRETE FORM ; STRUCTURE REPAIR
- 3426585 ULTRASONIC SYSTEM FOR INSPECTING SUBMERGED PILES  
OTHER KEYWORDS: PILE, STEEL ; STRUCTURE INSPECTION
- 3448585 POLE AND PILE PROTECTOR  
OTHER KEYWORDS: COATING ; ICE PROTECTION ; PILE PROTECTION
- 3505825 SYSTEM FOR REPLACING DETERIORATED WOOD PILING  
OTHER KEYWORDS: CONCRETE FORM ; PILE, CONCRETE ; STRUCTURE REPAIR
- 3514959 PEDESTAL TIMBER PILE SHOE  
OTHER KEYWORDS: PILE-DRIVING SHOE

Figure 12. Page from subject index of Volume I.

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annotations in the bibliography. Once a desirable patent has been found through inspection of the indexes or annotations, the other keywords for the patent may be used as guides to further searching in the subject index.

If information is needed on patents for floating breakwaters, for example, two approaches may be taken. In the first case, if no numbers for patents on floating breakwaters are known, the list of keyword definitions must be used to find at least one applicable keyword such as "Breakwater, floating." Next, the list of patents referenced to that keyword is located in a volume, as shown in Figure 11 for Volume III. Inspection of Figure 11 reveals that some of the patents have "Floating Breakwater" or something similar for a title and have only "Breakwater, floating" as a keyword. For that type of patent, exemplified by patent 3,991,576, the determination of the usefulness of the patent will require examination of the bibliography annotation or of the patent itself. The annotation for patent 3,991,576 is presented at the top of Figure 13 for comparison with the subject index information listed in Figure 11 and with the front page of the patent shown in Figure 1. In the second case, if the number for a floating breakwater patent is known and can be found in a title list, as was demonstrated for patent 3,991,576, then keywords can be taken directly from the patent's annotation and used for searching in the subject index with the confidence that the keywords apply to the type of patents desired.

Combinations of keywords may be used to identify distinct types of patents in the subject indexes. If patents on methods of repairing wood piles are desired, the keywords "Pile, wood" and "Structure repair" can be used together to pick out those patents. Figure 12 includes the list of patents referenced to "Pile, wood" in Volume I. Notice that most of the titles, like "Posting Piling," do not mention the type of piling involved in the patent. If methods of replacing a section of pile with concrete are desired, look for the keyword "Concrete form." Patent 3,410,097, with its annotation illustrated at the bottom of Figure 4, is an example. For methods of joining wood replacement sections to existing piles, look for "Pile section connection" in the absence of keywords mentioning concrete or steel. Patent 3,307,362, annotated at the bottom of Figure 14, is an example of a patent with this combination of keywords. Successful use of combinations of keywords requires close inspection of the keyword definitions and of the keywords assigned to patents of known value, plus experience in using the subject index.

Searches for patents issued before 1967 or after 1976 can be aided by the use of the classification information in the annotations. For a particular coastal engineering topic, classification codes corresponding to the topic or a keyword might be found by using the methods outlined above to select related patents in the CERC collection, then recording the classification codes common to all or most of the chosen patents. As discussed previously, the classification codes or lists of patents classified under the codes may be used as a guide to searching a patent

3,991,576

**FLOATING BREAKWATER**

Sadanori Tazaki, Kodairo, and Yozo Ishida, Kunitachi, both of Japan, assignors to Bridgestone Tire Company Limited, Tokyo, Japan

Division of Ser. No. 398,368, Sept. 18, 1973. This application Dec. 27, 1974, Ser. No. 536,783

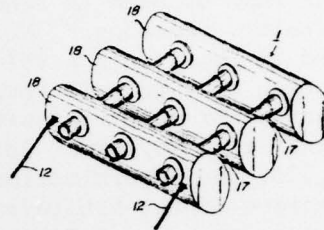
Claims priority, application Japan, Sept. 19, 1972, 47-107980; Sept. 30, 1972, 47-113640; May 9, 1973, 48-54312  
Int. Cl.<sup>2</sup> E02B 3/06

U.S. Cl. 61—5

1 Claim

A floating breakwater in which the floating body is formed by housing a floating material as a floating source and a weighting material as a source for increasing weight in a hollow shell composed of a rigid material and provided with a projection on the upper portion. The specific gravity of the floating body is made to be 0.15 - 0.75 owing to the floating material and the weighting material.

Keywords: Breakwater, floating



3,991,581

**METHOD AND APPARATUS FOR HANDLING PILING AND ANCHORING AN OFFSHORE TOWER**

Alfred Reeves Kolb, Corleston on Sea, England, assignor to Brown & Root, Inc., Houston, Tex.

Filed June 2, 1975, Ser. No. 582,677

Int. Cl.<sup>2</sup> E02B 17/00

U.S. Cl. 61—53.5

10 Claims

A method and apparatus for handling piling and anchoring an offshore tower are disclosed wherein sudden loading of a derrick handling the piling is avoided as the piling is moved into position preparatory to driving. The apparatus entails a base intended to rest upon an upper end of a piling guide. A releasable gripping means is connected to the base and serves to grip and restrain an add-on piling while the add-on piling is connected to a piling connected and thus suspended within the piling guide and also while the suspended piling is released therefrom. Releasing means are employed to release the gripping means to permit concurrent downward movement of the add-on and suspended piling.

In further aspects, the apparatus and method of the invention effect the connection of an add-on piling to a piling suspended from an offshore tower by first at least partially enclosing the add-on piling within a chuck releasably gripping the add-on piling. The add-on and chuck are next hung from the boom of a floating derrick and the add-on piling is connected to the suspended piling. The piling is thereafter disconnected from the piling guide while the suspension thereof is concurrently maintained by a restraining engagement between the chuck and the piling guide. Ultimately the piling is lowered and forced into the strata underlying the floor of the body of water.

Keywords: Offshore platform, fixed; Offshore platform, leg; Pile placement; Pile section connection

U.S. Cl. X.R. 61-86

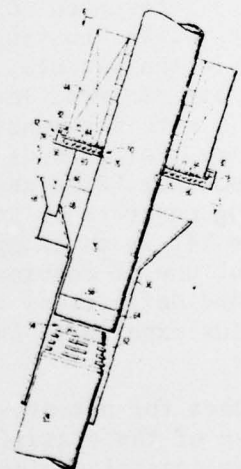


Figure 13. Annotations illustrating assignment of keywords.

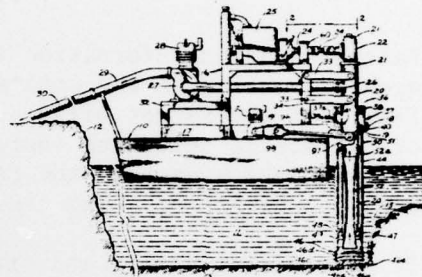
MARCH 7, 1967

3,307,278  
**SONIC DREDGING PROCESS AND APPARATUS**  
Albert G. Bodine, Jr., 7877 Woodley Ave.,  
Los Angeles, Calif. 91406  
Filed Nov. 24, 1964, Ser. No. 413,495  
21 Claims. (Cl. 37-195)

Keywords: Dredge, cutterhead; Dredge, suction

1. In a sonic apparatus for dredging earth material from the earthen bottom of a body of water, the combination of:

- a dredge tube extending downwardly to a position adjacent to said earthen bottom,
- a resonant sonic vibration radiator at the lower end of said dredge tube for stirring up earthen material at said bottom and bringing it into suspension in the water so as to form a slurry adjacent said lower end of said dredge tube,
- a resonant elastic vibration system vibratorily coupled to said radiator,
- sonic generating means for driving said sonic wave radiator, said generating means being operable at a frequency which will produce sonic wave vibration, and
- means for circulating said slurry up said dredge tube.



3,307,362  
**POSTING PILING**  
DuVal Cravens, Buffalo, N.Y., and Robert F. McGuire,  
Shawnee Mission, Kans., assignors to Osmose Wood  
Preserving Co. of America, Inc., Buffalo, N.Y.  
Filed Dec. 12, 1963, Ser. No. 330,113  
3 Claims. (Cl. 61-54)

Keywords: Pile section connection; Pile, wood;  
Structure repair

1. The method of repairing piling and the like having a deteriorated section which comprises removing the deteriorated section, preparing a replacement section slightly shorter than the removed deteriorated section, treating the exposed end surfaces of the piling and of the replacement section with preservative, applying spacing members to the exposed ends of the replacement section, applying an epoxy resin to the exposed ends of the piling and of the replacement section, positioning the replacement section in the piling in place of the removed deteriorated section, the replacement section being of sufficient length that with the spacing members and the resin it contacts the exposed ends of the piling forming a first set of pin-receiving holes extending obliquely through the replacement section across the joint and into the piling below the replacement section, and inserting pins in said holes, being spaced apart around the posted piling.

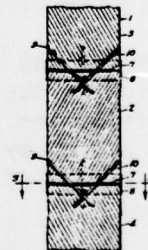


Figure 14. Additional annotations illustrating assignment of keywords.



collection. This method cannot be used if the patents in the CERC collection have been reclassified since they were issued. For instance, in January 1979, the class code for "Hydraulic and Earth Engineering," the class containing most shore protection and harbor structures, was changed from 61 to 405 with corresponding changes in all of the subclass codes. Table 4 gives all the new codes for the class. Currently, all of the patents in the coastal engineering collection assigned class code 61 would be found in a library collection filed under class code 405 with their subclass codes altered according to the differences between Figure 2 and Table 4.

## VII. SUMMARY

Patents contain information valuable to designers, inventors, and researchers working in the coastal engineering field, but the size and complexity of the Patent Office collection have hindered the widespread use of patents as reference sources. The CERC patent collection and its search aids make a part of the Patent Office collection more accessible to technical personnel. The search aids include:

1. The patent number and title lists which are used to determine whether a patent is in the collection;
2. the subject indexes which are used to identify patents involving specific topics;
3. the detailed set of keyword definitions which describe how topics are grouped together in the subject indexes;
4. the annotations which present information on the invention, inventor, assignee, application and patent documents, classification codes and keywords; and
5. the instructions on locating and examining copies of patents.

In some cases the search aids may be used to link the keywords of the CERC collection to the classification codes of the Patent Office collection, simplifying the identification of useful patents issued outside the time period covered by the CERC collection and improving the usefulness of the whole patent collection.

Table 4. Revised codes for "Hydraulic and Earth Engineering" from the *Manual of Classification of Patents*.

CLASS 405 HYDRAULIC AND EARTH ENGINEERING

JANUARY 1979

|    |  |     |   |
|----|--|-----|---|
| 1  | MARINE VESSEL PORTAGE, LAUNCHING, OR REMOVING                    | 66  | ...With barrier storage or deployment feature               |
| 2  | ..Rail mounted carrier   | 67  | ....Quick release float                                     |
| 3  | ..Lifting  | 68  | ....Inflatable or deflatable                                |
| 4  | ..Dry dock   | 69  | .....Self-inflating   |
| 5  | ..Fabrication  | 70  | ...Having joint detail                                      |
| 6  | ..Gate   | 71  | ....Having hinged joint between rigid sections              |
| 7  | ..Vessel support (e.g., bilge or keel block)                     | 72  | ...With reinforcing feature                                 |
| 8  | PRESSURIZED CAISSON  | 73  | ..Erosive scouring  |
| 9  | ..Having lifting cable   | 74  | ..Settling of suspended matter or removal of settled matter |
| 10 | ..Movable relative to mobile support                             | 75  | ..Extracting power from moving fluid                        |
| 11 | MEANS TO EXPOSE A NORMALLY WETTED SURFACE, E.G., COFFERDAM, ETC. | 76  | ..Wave or tide  |
| 12 | ..Contoured to wetted surface, e.g., side hung ship caisson      | 77  | ...With flow restrictor or ramp                             |
| 13 | ..Having transport, placement, or dislodgement means             | 78  | ..Associated with dam                                       |
| 14 | ..Connectable sections   | 79  | ..Wave generation or enhancement                            |
| 15 | BANK, SHORE, OR BED PROTECTION                                   | 80  | ..Flow control  |
| 16 | ..Revetment  | 81  | ..Fishway   |
| 17 | ..Revetment laying   | 82  | ...Elevator   |
| 18 | ..Continuous concrete or concrete filled bag                     | 83  | ...Closed channel   |
| 19 | ..Mattress   | 84  | ..Navigable canal   |
| 20 | ...Hinged concrete sections                                      | 85  | ...Having lock  |
| 21 | ..Wave or flow dissipation                                       | 86  | ....Movable lifting member                                  |
| 22 | ..Fluid application  | 87  | ..Water gate or adjustable weir                             |
| 23 | ..Floatable dissipator submerged at site                         | 88  | ...Center flow  |
| 24 | ..Artificial seaweed   | 89  | ...Uniform discharge  |
| 25 | ..Bed supported subsurface dissipator                            | 90  | ...Removable  |
| 26 | ..Floating   | 91  | ...Flexible   |
| 27 | ..Openwork   | 92  | ...Condition responsive                                     |
| 28 | ..Flexibly suspended from or pivoted to support                  | 93  | ....To weight of liquid separated from a main body          |
| 29 | ..Polypod  | 94  | ....To pressure on pivoted water gate                       |
| 30 | ..Openwork or concave face                                       | 95  | ....With latch for closed position                          |
| 31 | ...Associated with solid wall                                    | 96  | ....Float   |
| 32 | ...With fabric   | 97  | ....Having separate float chamber                           |
| 33 | ...Interfitted or interleaved members                            | 98  | ...Roller or flexible                                       |
| 34 | ...Jetty   | 99  | ...Swinging   |
| 35 | ...Spaced members  | 100 | ...About horizontal axis                                    |
| 36 | DRAINAGE OR IRRIGATION   | 101 | ....Overflow  |
| 37 | ..Control means responsive to sensed condition                   | 102 | .....Collapsible  |
| 38 | ..Including subsurface moisture barrier                          | 103 | ...Sliding  |
| 39 | ..Having regulation of flow through channel                      | 104 | ...Vertical   |
| 40 | ..At outlet or intake  | 105 | ....Gate unseating  |
| 41 | ...Riser or standpipe outlet or intake                           | 106 | ....With lift mechanism or latch                            |
| 42 | ..End cap  | 107 | ..Artificial water barrier (e.g., dam, levee, etc.)         |
| 43 | ..Porous or apertured pipe, flume, or tileway                    | 108 | ...Having spillway  |
| 44 | ..Uniform discharge  | 109 | ...Having impervious core                                   |
| 45 | ..Porous   | 110 | ...Hollow or buttressed                                     |
| 46 | ..Earthen bottom   | 111 | ...With ballast compartment or cavity                       |
| 47 | ..Flow through joint   | 112 | ...Vertical wall buttress                                   |
| 48 | ..Open seam or shielded outlet                                   | 113 | ...Tension stayed   |
| 49 | ..Corrugated   | 114 | ...Connectable sections                                     |
| 50 | ..Porous waterway, e.g., sand drain, etc.                        | 115 | ...Flexible   |
| 51 | ..Branched flow  | 116 | ...In situ construction                                     |
| 52 | FLUID CONTROL OR TREATMENT                                       | 117 | ...Earthen  |
| 53 | ..Fluid storage in earthen cavity                                | 118 | ..Open channel  |
| 54 | ...With indicator or alarm means                                 | 119 | ...Flume  |
| 55 | ..Cavity construction  | 120 | ...Elbow or tee   |
| 56 | ...Including cooling or heating of material surrounding cavity   | 121 | ...Joint  |
| 57 | ...Earth treatment   | 122 | ....Including U-clamp                                       |
| 58 | ...Dissolving earth  | 123 | ....With crossbar   |
| 59 | ..Supply or recovery of stored fluid by separate fluid           | 124 | ..Culvert   |
| 60 | ..Floatable matter control                                       | 125 | ...Terminal or head   |
| 61 | ..Ice  | 126 | ...Serially connected segments                              |
| 62 | ..Barrier formed by fluid  | 127 | ...Intake   |
| 63 | ..Floating barrier   | 128 | WASTE DISPOSAL IN SOIL                                      |
| 64 | ...Submergible   | 129 | ..Landfill  |
| 65 | ...With means to seal space between barrier and fixed structure  | 130 | TEMPERATURE MODIFICATION OR CONTROL OF EARTHEN FORMATION    |
|    |  | 131 | ..Heating   |
|    |  | 132 | UNDERGROUND PASSAGEWAY, E.G., TUNNEL                        |
|    |  | 133 | ..Vertical  |
|    |  | 134 | ..Sectional   |
|    |  | 135 | ...Seal or joint  |
|    |  | 136 | ..Subaqueous  |
|    |  | 137 | ..Below bed   |

Table 4. Revised codes for "Hydraulic and Earth Engineering" from the *Manual of Classification of Patents*.--Continued

CLASS 405 HYDRAULIC AND EARTH ENGINEERING

JANUARY 1979

|     |  |     |   |
|-----|--|-----|---|
| 138 | UNDERGROUND PASSAGEWAY, E.G., TUNNEL   | 189 | ..With communication between inhabitable enclosures                                 |
| 139 | ..Boring   | 190 | ..Remote control  |
| 140 | ..By auxiliary tunnel  | 191 | ..From surface  |
| 141 | ..By axially overlapped members  | 192 | ..With air lock   |
| 142 | ..Shield   | 193 | ..With pressure equalization  |
| 143 | ..With transverse force application  | 194 | ..With continuous surface access  |
| 144 | ..feature  | 195 | MARINE STRUCTURE OR FABRICATION THEREOF   |
| 145 | ...Direction control   | 196 | ..With work deck vertically adjustable relative to floor                            |
| 146 | ...Door or bulkhead  | 197 | ..Sectional leg   |
| 147 | ...Discrete independently advanceable earth supporting segments                            | 198 | ..Longitudinally extending projections or recesses                                  |
| 148 | ...Lining installation   | 199 | ..Frictional gripper  |
| 149 | ...Seal  | 200 | ..By buoyancy control   |
| 150 | ...Work platform   | 201 | ..With horizontally movable work deck   |
| 151 | ...Cut and cover   | 202 | ..With pivotal connection between work deck and base                                |
| 152 | ...Lining  | 203 | ..Floatable to site and supported by marine floor                                   |
| 153 | ...Panel   | 204 | ..With assembly of sectional supporting structure at site                           |
| 154 | ...With sealing feature  | 205 | ..With ballasting means to sink or position structure at site                       |
| 155 | ...With separate fastening means between adjacent panels                                   | 206 | ...Detachable from structure  |
| 156 | PIPE OR CABLE LAYING, RETRIEVING, OR UNDERWATER MANIPULATION                               | 207 | ...Compartment in base  |
| 157 | ..Cast in situ   | 208 | ...And leg depending from base  |
| 158 | ..With forming or cutting of pipe or cable   | 209 | ..Separable transport means   |
| 159 | ..With protection or indication of pipe or trench  | 210 | ..Storage container   |
| 160 | ..Submerging, raising, or manipulating line of pipe or cable in or from marine environment | 211 | ..Structure protection  |
| 161 | ..Entrenched or buried   | 212 | ..Fender  |
| 162 | ..Condition responsive   | 213 | ...Roller type  |
| 163 | ..Entrenching or burying apparatus   | 214 | ...Having coil spring   |
| 164 | ...guided by pre-positioned pipe or cable  | 215 | ...Resilient block  |
| 165 | ....With apparatus buoyancy control  | 216 | ..Sleeve or coating   |
| 166 | ....With bottom fluidizing means   | 217 | ..In or on frozen media   |
| 167 | ..By towing submerged sled with attached plow and pipe or cable guide                      | 218 | ..Dock  |
| 168 | ....With means to forcibly feed or to control tension in pipe or cable                     | 219 | ..Floating  |
| 169 | ..Facilitated by extension from line-laying vessel   | 220 | ..Hinged  |
| 170 | ..Articulated segments   | 221 | ..Vertically adjustable   |
| 171 | ..With causing or controlling the deformation of a line                                    | 222 | ..Cast in situ  |
| 172 | ..With assembling of line structure  | 223 | ..Installing means  |
| 173 | ..By joining successive sections of line   | 224 | ..With anchoring of structure to marine floor                                       |
| 174 | ..By control of buoyancy   | 225 | ..By grouting preformed structure   |
| 175 | ..With anchoring of line   | 226 | ..Including floor modifying means   |
| 176 | ..With raising of line from marine floor   | 227 | ..By pile extending through sleeve in structure                                     |
| 177 | ..By means advancing along terrain and guiding pipe or cable into subterranean position    | 228 | ..Pile driving  |
| 178 | ..Condition responsive   | 229 | FOUNDATION  |
| 179 | ..Tape or strip  | 230 | ..Underpinning  |
| 180 | ..With positive feed or means to vary tension in pipe or cable                             | 231 | ..Columnar structure (e.g., pier, pile)   |
| 181 | ..Simultaneous laying of plural parallel pipes or cables                                   | 232 | ..Process or apparatus for installing   |
| 182 | ..With backfill or bedding material conveying or dispensing means                          | 233 | ...Casting in situ hardenable fluent material                                       |
| 183 | ..Including trench forming plow with pipe or cable guide                                   | 234 | ....With heating, cooling, or explosion   |
| 184 | ...With depth adjustment   | 235 | ....With subsequent moving  |
| 185 | ...With plow vibrating or oscillating means  | 236 | ....Subsurface dispensing of material for flow toward surface                       |
| 186 | ...Guide integral with or rigidly fixed to plow  | 237 | ....Forming subsurface enlargement  |
| 187 | ..Advancing subterranean length of pipe or cable   | 238 | ....Preformed enlargement cavity  |
| 188 | DIVING   | 239 | ....Providing embedded metallic reinforcement                                       |
|     | ..Suit or accessory therefor   | 240 | ....Dispensing fluent material while withdrawing dispenser                          |
|     | ..Rigid element  | 241 | ....Dispensing auger  |
|     | ..Underwater docking or mooring  | 242 | ....Driven dispenser with separable tip   |
|     |  | 243 | ....Withdrawing form structure  |
|     |  | 244 | ...With anchoring of structure  |
|     |  | 245 | ...Driving removable wall supporting core   |
|     |  | 246 | ....Diametrically retractable core  |
|     |  | 247 | ....Fluid pressure actuated   |
|     |  | 248 | ....With subsurface fluid discharge   |
|     |  | 249 | ...Caisson or hollow shaft  |
|     |  | 250 | ...Comprising series of connected longitudinal sections having diverse compositions |



Table 4. Revised codes for "Hydraulic and Earth Engineering" from the *Manual of Classification of Patents*.--Continued

CLASS 405 HYDRAULIC AND EARTH ENGINEERING

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|     |   |
|-----|---|
|     | FOUNDATION  |
| 251 | .Columnar structure (e.g., pier, pile)                          |
|     | ..With joint or connection between sections of similar material |
| 252 | ...Between concrete sections                                    |
| 253 | ..With driving or cutting tip                                   |
| 254 | ...Longitudinally ribbed  |
| 255 | ..With end cap  |
| 256 | ..Concrete  |
| 257 | ...With form or casing  |
| 258 | EARTH TREATMENT OR CONTROL                                      |
| 259 | .Rock or earth bolt or anchor                                   |
| 260 | ..With grouting feature   |
| 261 | ...Breaking canister or packet                                  |
| 262 | ..With retaining wall   |
| 263 | .Chemical   |
| 264 | ..Organic   |
| 265 | ...Bituminous   |
| 266 | ..Cementitious (e.g., grouting)                                 |
| 267 | ...Filling subterranean cavity (e.g., underground wall)         |
| 268 | ...Lining   |
| 269 | ...Injector   |
| 270 | .Impermeabilization   |
| 271 | .Compaction   |
| 272 | .Shoring, bracing, or cave-in prevention                        |
| 273 | ..Cribbing  |
| 274 | ..Sheet piles   |
| 275 | ...Concrete   |
| 276 | ...Metal  |
| 277 | ....C or I sections   |
| 278 | ....Head and claw interlock                                     |
| 279 | ....With separate fastening, reinforcing or sealing means       |
| 280 | ....Cellular  |
| 281 | ....Bulb and socket interlock                                   |
| 282 | ..Trench shoring  |
| 283 | ...Shield type  |
| 284 | ..Retaining wall  |
| 285 | ...Pile and panel   |
| 286 | ...Concrete   |
| 287 | ....Cast in situ  |
| 288 | ..Roof support  |
| 289 | ...Inflatable   |
| 290 | ...Jack   |
| 291 | ....Mobile  |
| 292 | .....Position restoring   |
| 293 | .....With canopy extension                                      |
| 294 | .....Telescoping  |
| 295 | .....Cantilevered   |
| 296 | .....With rubble shield   |
| 297 | .....With contour following feature                             |
| 298 | .....Under load advanceable                                     |
| 299 | .....Self-advanceable   |
| 300 | .....Paired   |
| 301 | .....Nested   |
| 302 | .....Control system   |
| 303 | MISCELLANEOUS   |

|  |  |
|--|--|
| <p>Ray, Robert E.</p> <p>An annotated bibliography of patents related to coastal engineering / by Robert E. Ray, Michael D. Dickey, and Annie M. Lyles. - Fort Belvoir, Va. : U.S. Coastal Engineering Research Center ; Springfield, Va. : available from National Technical Information Service, 1979. 47 p. : ill. ; 27 cm. - (Miscellaneous report ; no. 79-6)</p> <p>Cover title.</p> <p>Report describes a collection of 2,468 coastal engineering patents (issued by the U.S. Patent Office from 1967 to 1976), published as a separate limited-edition three-volume appendix to this report. A bibliographical guide to the collection and instructions on the use of the patents and search aids are provided.</p> <p>1. Bibliography. 2. Coastal engineering. 3. Patents. I. Title. II. Dickey, Michael D. III. Series: U.S. Coastal Engineering Research Center. Miscellaneous report no. 79-6.</p> <p>TC203 .U581mr no. 79-6 627</p> | <p>Ray, Robert E.</p> <p>An annotated bibliography of patents related to coastal engineering / by Robert E. Ray, Michael D. Dickey, and Annie M. Lyles. - Fort Belvoir, Va. : U.S. Coastal Engineering Research Center ; Springfield, Va. : available from National Technical Information Service, 1979. 47 p. : ill. ; 27 cm. - (Miscellaneous report ; no. 79-6)</p> <p>Cover title.</p> <p>Report describes a collection of 2,468 coastal engineering patents (issued by the U.S. Patent Office from 1967 to 1976), published as a separate limited-edition three-volume appendix to this report. A bibliographical guide to the collection and instructions on the use of the patents and search aids are provided.</p> <p>1. Bibliography. 2. Coastal engineering. 3. Patents. I. Title. II. Dickey, Michael D. III. Series: U.S. Coastal Engineering Research Center. Miscellaneous report no. 79-6.</p> <p>TC203 .U581mr no. 79-6 627</p> |
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